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# BOOKS BUILD BETTER BRAINS

## HOW PROMOTING LITERACY IS KEY TO EARLY BRAIN AND CHILD DEVELOPMENT

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UNIVERSITY OF WISCONSIN-MADISON

MEDICAL DIRECTOR, REACH OUT AND READ WISCONSIN



# Disclosure

**I have no relevant financial relationships  
to disclose.**

**I will not discuss off-label use or  
investigational use in my presentation.**

**Although...**





**I don't know if “mouthing” is an FDA-approved use of board books.**

“Oh, that’s so nice...”  
**CRITICAL**

**A stroll through the Early Brain**

**Reading Reality**

**Reach Out and Read**

# *First, a story...*

(Slides 7–28 consist of copyrighted picture book images and are not included in the print version.)

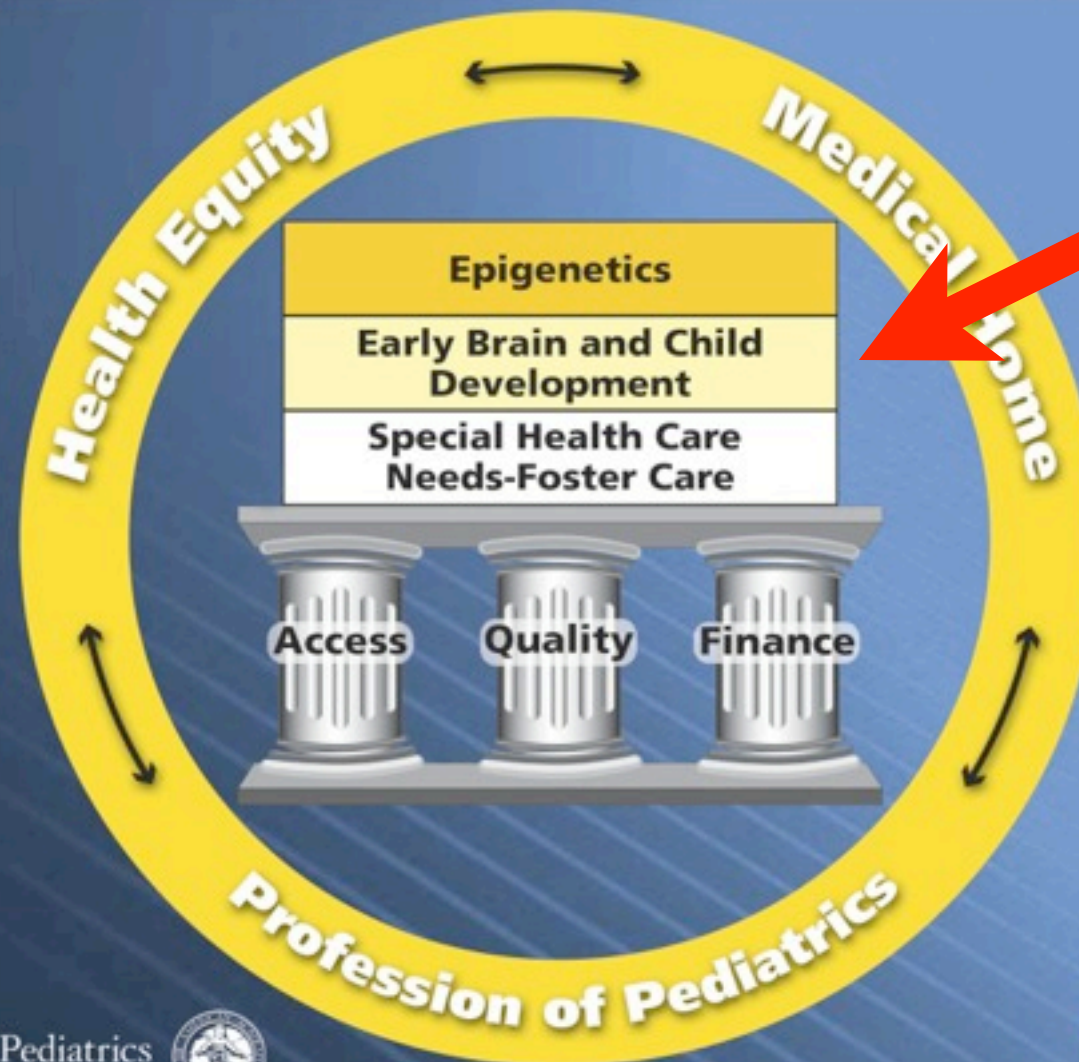
# *Part One*

## **A Stroll Through the Early Brain**



# AAP Agenda for Children 2011-2012

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■ Planning  
■ Implementing  
■ Integrating

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■ Planning

# EARLY BRAIN AND CHILD DEVELOPMENT

The background of the slide is a dark, semi-transparent overlay of a classical painting. On the left, a nude male figure is reclining on a dark, draped surface, looking towards the right. On the right, a group of figures, including a central figure with long, curly hair, are depicted in a dramatic, possibly religious or mythological scene. The overall tone is somber and academic.

from *The Science of Early Childhood Development*  
National Scientific Council on the Developing Child, 2007

*mind is its own place  
of Hell; a  
John Milton: "Para*



# EARLY BRAIN AND CHILD DEVELOPMENT

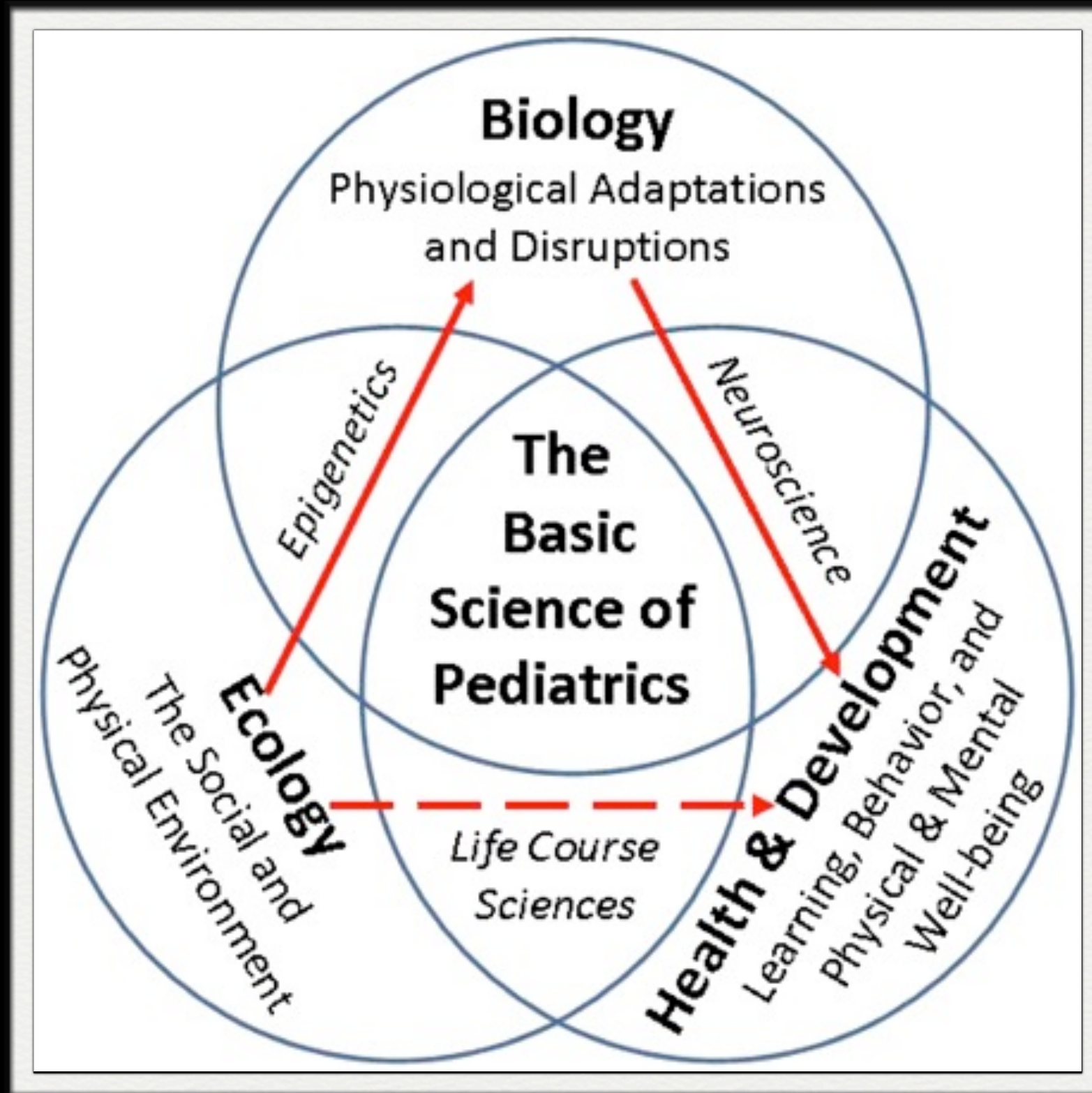
1

Child development is a foundation for **community** development and **economic** development, as capable children become the foundation of a prosperous and sustainable society.

2

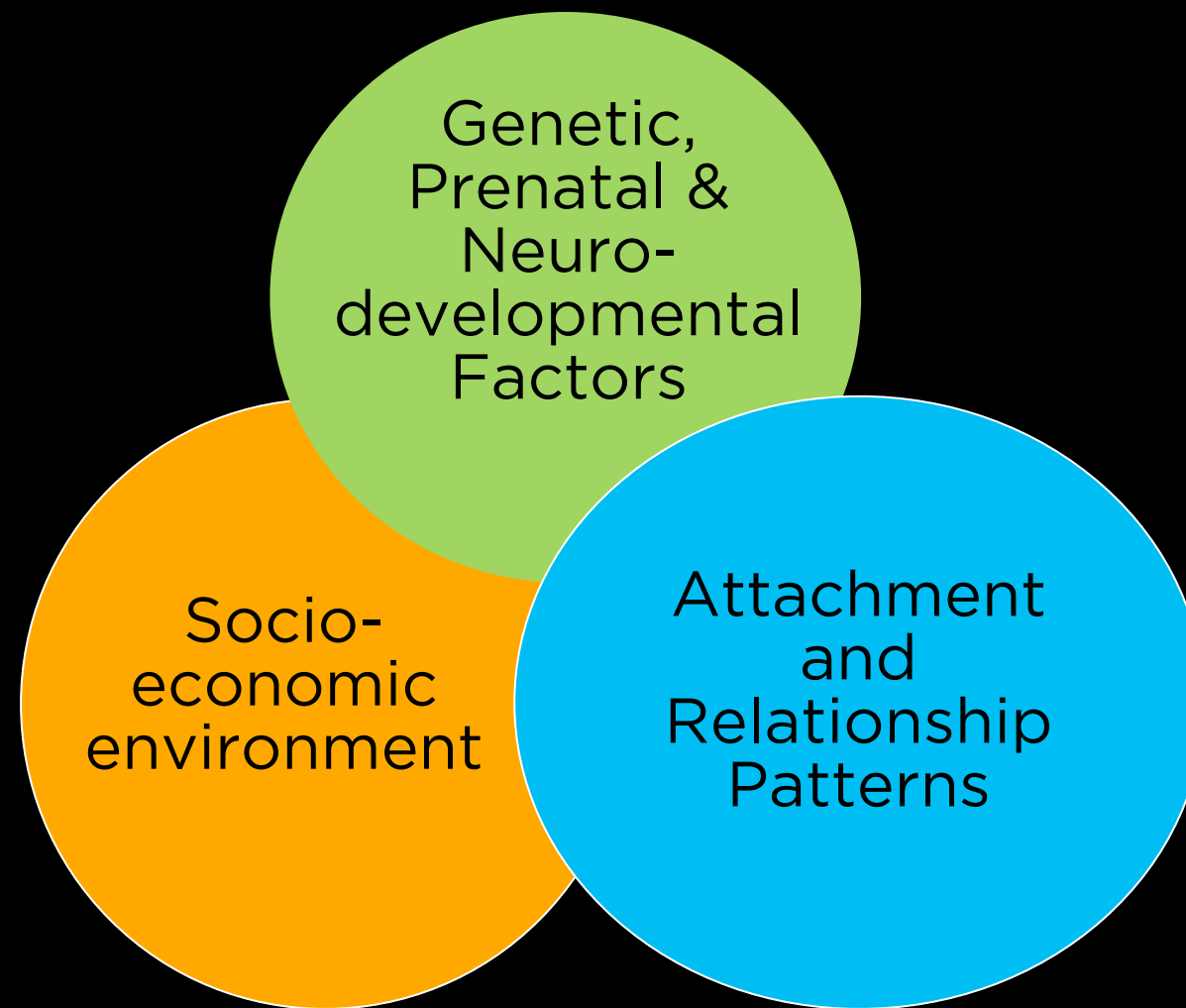
Brains are built **over time**.

# Eco-biodevelopmental Model





# The **3-legged stool** for developmental and health trajectories



# EARLY BRAIN AND CHILD DEVELOPMENT

## 3

The interactive influences of genes and experience literally **shape** the architecture of the developing brain and the active ingredient is the “**serve and return**” nature of children’s engagement in relationships with their parents and other caregivers in their family or community.

# The Face to Face Paradigm

## Edward Z Tronick





# EARLY BRAIN AND CHILD DEVELOPMENT

## 4

Both brain architecture and developing abilities are built “from the bottom up” with simple circuits and skills providing the **scaffolding** for more advanced circuits and skills over time.

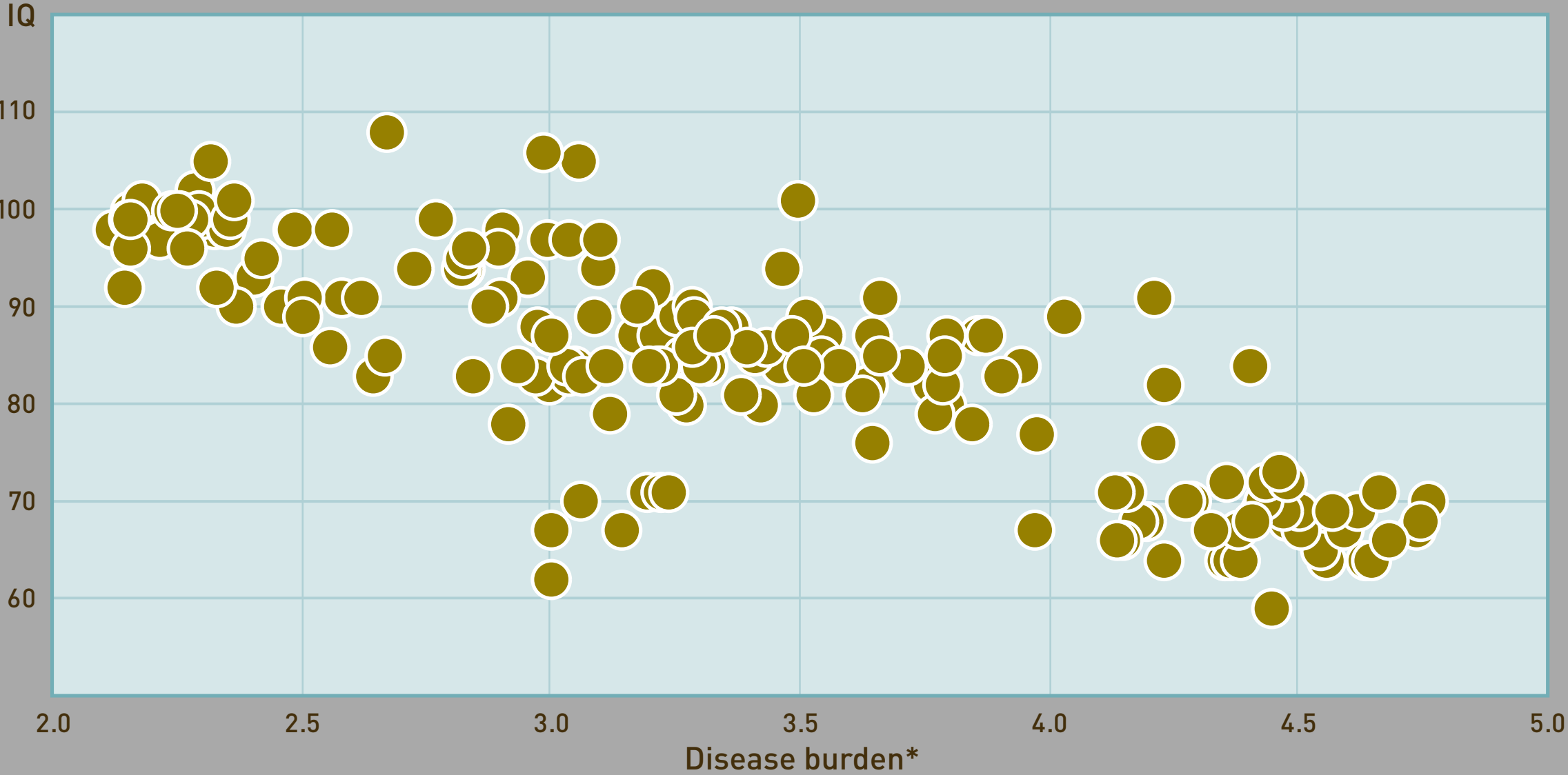


# EARLY BRAIN AND CHILD DEVELOPMENT

## 5

Toxic stress in early childhood is associated with **persistent** effects on the nervous system and stress hormone systems that can **damage developing brain architecture** and lead to lifelong problems in learning, behavior and both physical and mental health.

Correlation between IQ and disease burden in 184 selected countries



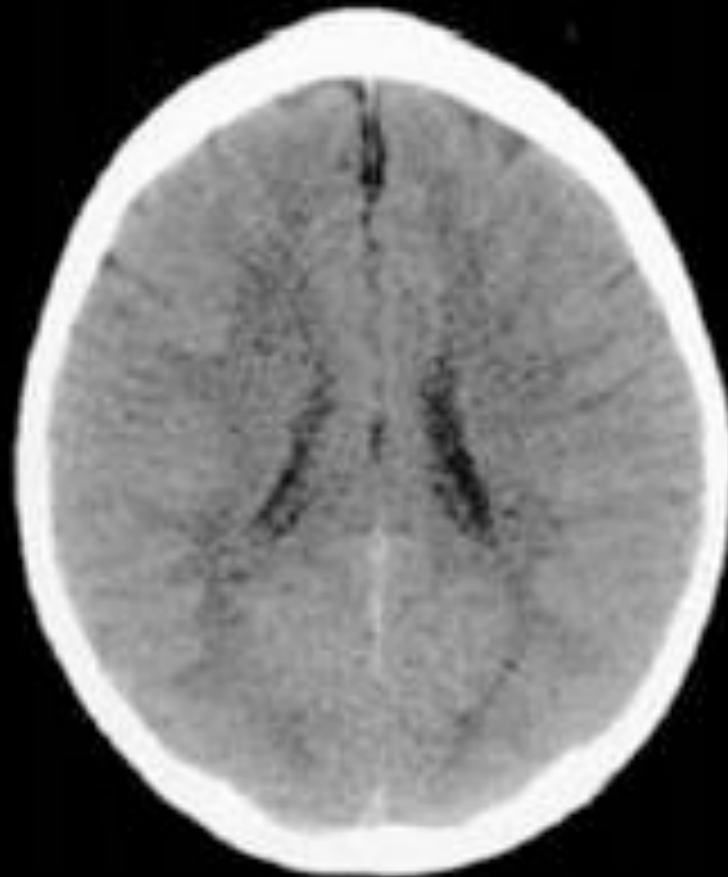
*\*The logarithm of disability-adjusted life years (DALYs) lost to 28 representative and important human infectious diseases.*

Source: Christopher Eppig,  
University of New Mexico

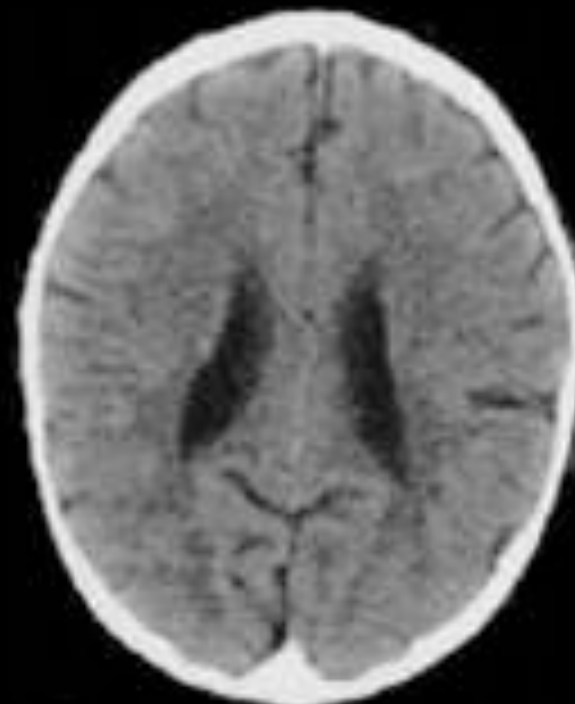
*\*The logarithm of disability-adjusted life years (DALYs) lost to 28 representative and important human infectious diseases.*

UNIVERSITY OF NEW MEXICO  
SOURCE: CHRISTOPHER EPPIG

### 3 Year Old Children



Normal



Extreme Neglect

Normal

Extreme Neglect

# THE STRESS RESPONSE:

increases in cortisol and epinephrine



## Three Levels of Stress Response

### Positive

Brief increases in heart rate,  
mild elevations in stress hormone levels.

### Tolerable

Serious, temporary stress responses,  
buffered by supportive relationships.

### Toxic

Prolonged activation of stress response systems  
in the absence of protective relationships.

Source: Center on the Developing Child at Harvard University

Social-emotional buffering  
is the **primary factor**  
distinguishing level of stress.

Andy Garner, MD

# Adversity & Toxic Stress

Toxic stress is the  
**key intergenerational transmitter**  
of social and health disparities

# POSITIVE STRESS

Child sees someone approaching  
with their immunization syringe

Parent leaving on the first day of preschool

# TOLERABLE STRESS

Death of a family member

Serious illness

Natural disaster

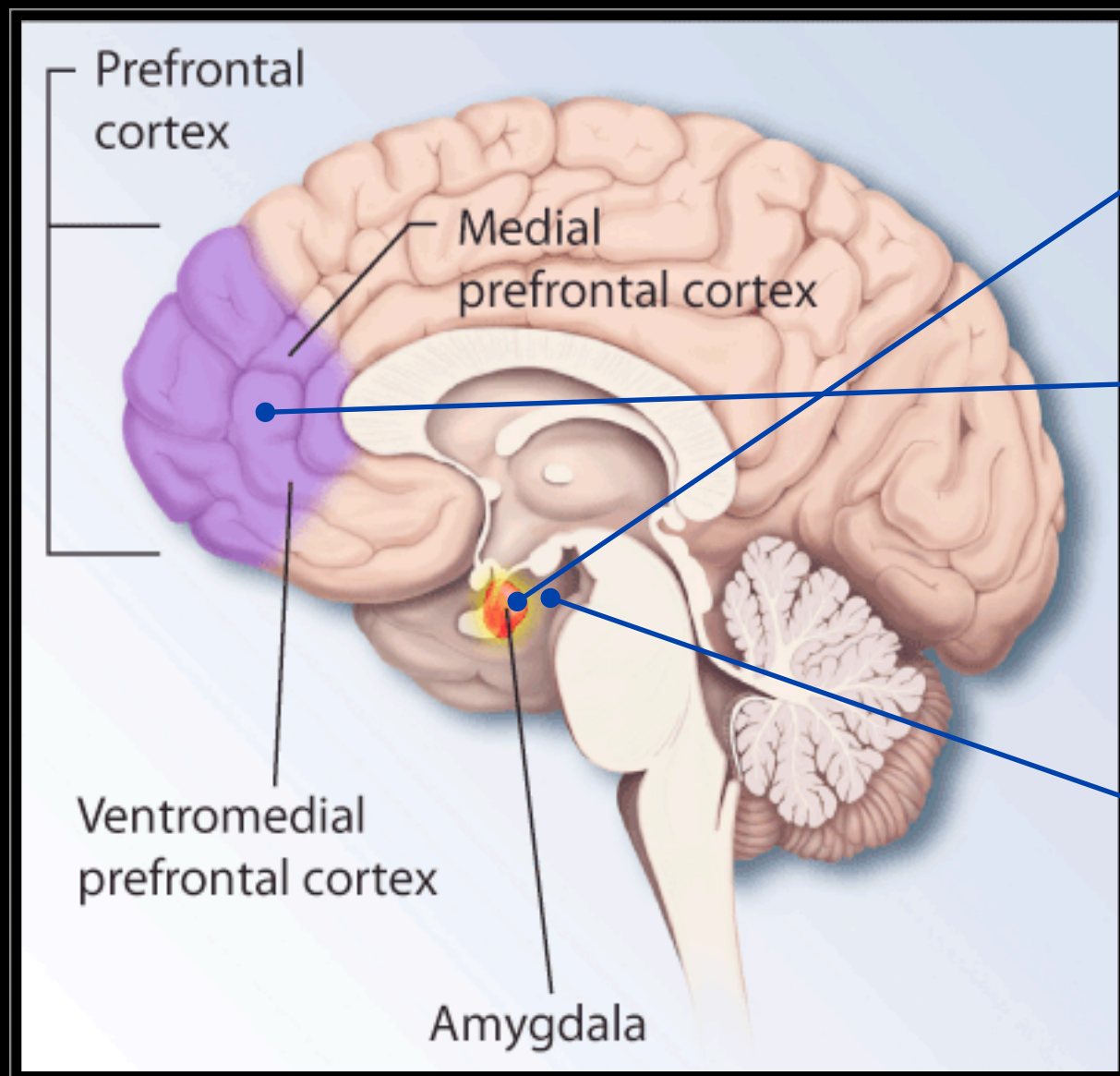


What if it's worse?  
What if there's no supportive relationships?

Child abuse  
Parental substance abuse  
Homelessness

**TOXIC STRESS**

# What happens?



## **Amygdala:**

activates the stress response

*Toxic stress:* enlargement

## **Prefrontal cortex:**

usually a check to the amygdala

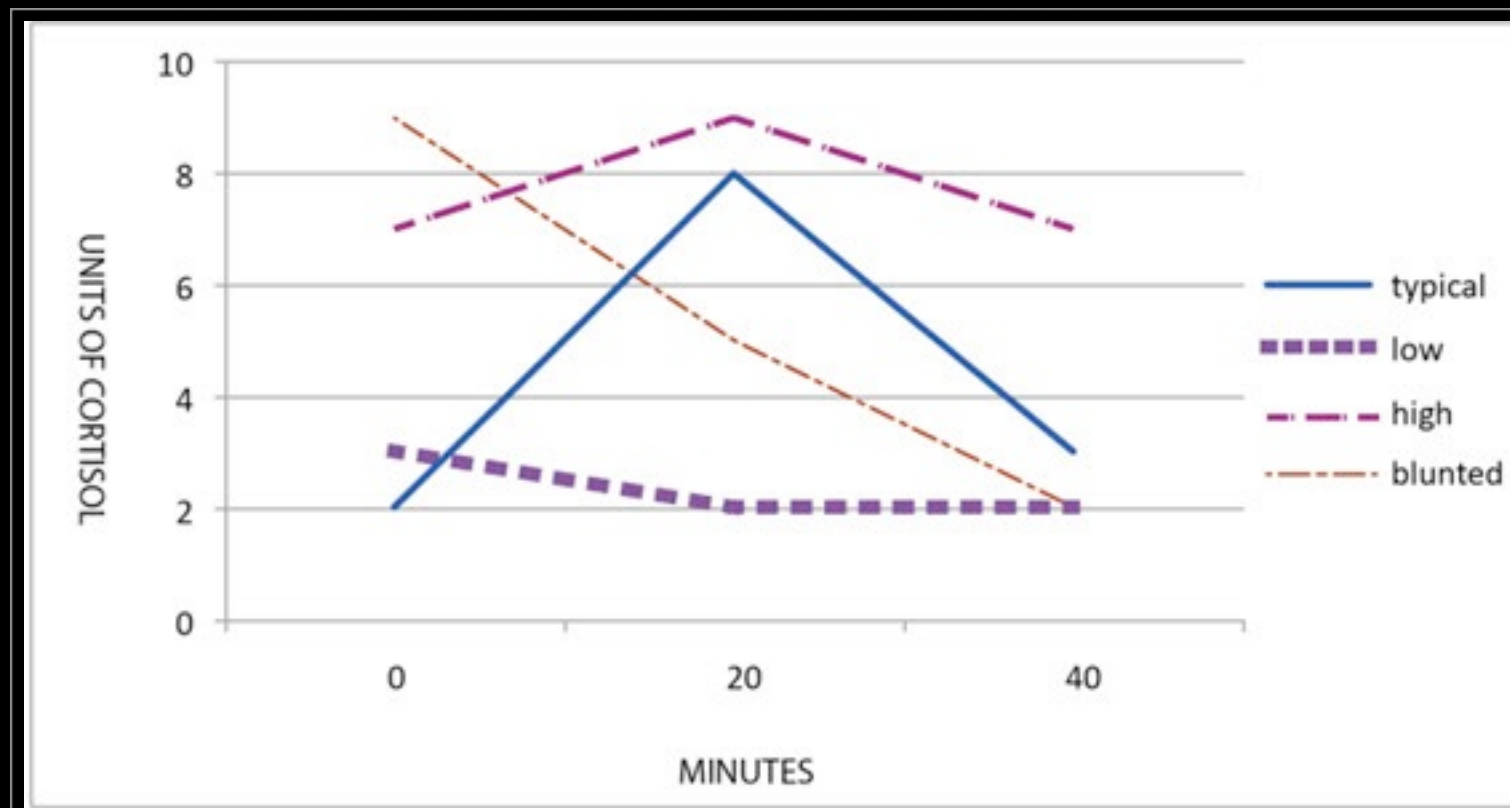
*Toxic stress:* loss of neurons, less able to function

## **Hippocampus:**

major role in memory and mood

*Toxic stress:* impairment in understanding and emotion

# POVERTY IS NEUROTOXIC



Children with “typical” cortisol response had **higher** executive function, and were rated as having **more** self-control in the classroom.

Those with a flat (high or low) or blunted response had **low** levels of executive function and were rated as having **poor** self-regulation.

# POVERTY IS NEUROTOXIC

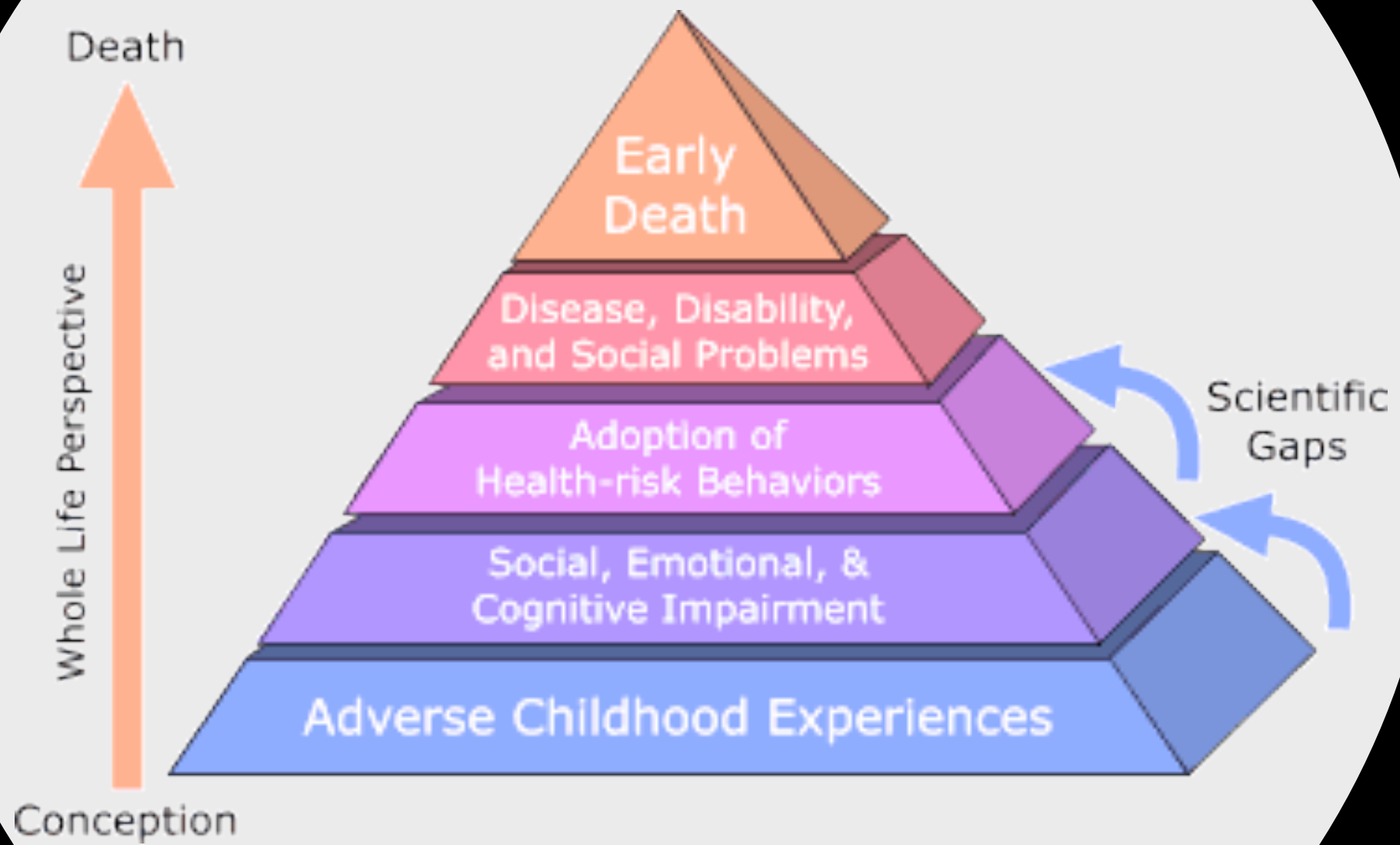
Next, children in a large (1200) study whose mothers engaged in “scaffolding” during play had lower cortisol levels and were more attentive.

Those who were more authoritative had higher cortisol levels and were found to be less attentive.

This was found at 7 months of age and again at 15 months.

They also found that the more impoverished the family, the less likely they were to engage in scaffolding.





# THE ADVERSE CHILDHOOD EXPERIENCES STUDY

The Most Important Study  
You've (Probably) Never Heard Of.

In 1985, Dr Vincent Felitti noticed many patients in his obesity treatment programs had prior history of abuse or trauma

The CDC worked with Kaiser Permanente and looked retrospectively at over 17,000 patients.

This was the first study to simultaneously assess childhood exposure to multiple types of abuse, neglect, domestic violence and serious household dysfunction.

# THE ADVERSE CHILDHOOD EXPERIENCES STUDY

Study participants were middle-class Americans from San Diego, 80% white, 74% attended college, average age of 57, split evenly between men and women.

**Not exactly an impoverished,  
“at-risk” population.**

# THE ADVERSE CHILDHOOD EXPERIENCES STUDY

Emotional Abuse (10%)

Physical Abuse (26%)

Sexual Abuse (21%)

Emotional Neglect (15%)

Physical Neglect (10%)

Mother treated violently (13%)

Household substance abuse (28%)

Household mental illness (20%)

Parental separation or divorce (24%)

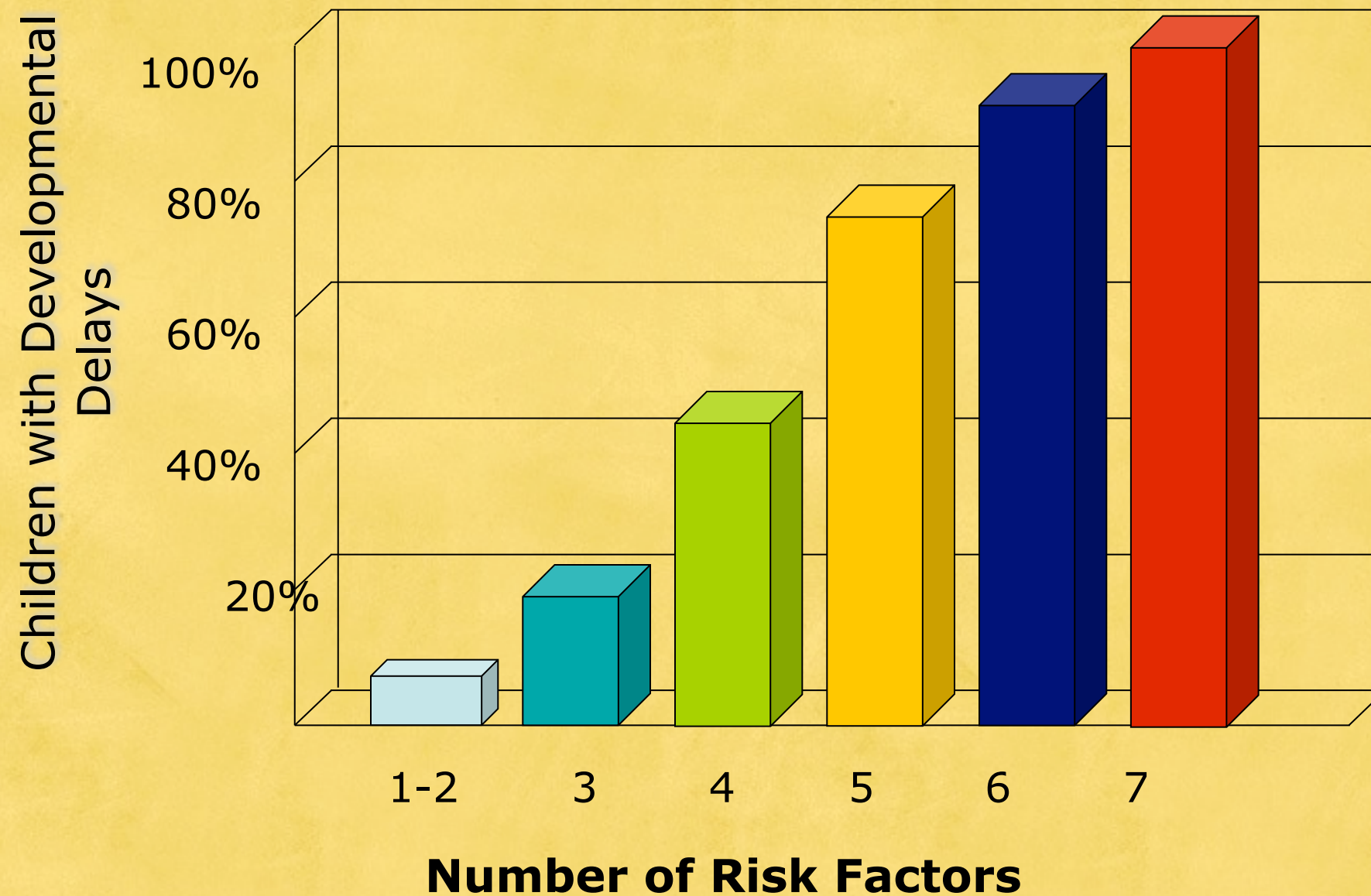
Incarcerated household member (6%)



ACE Score (one point for each category listed)	Prevalence in study
0	33%
1	26%
2	16%
3	10%
4	6%
5	5%
6	6%

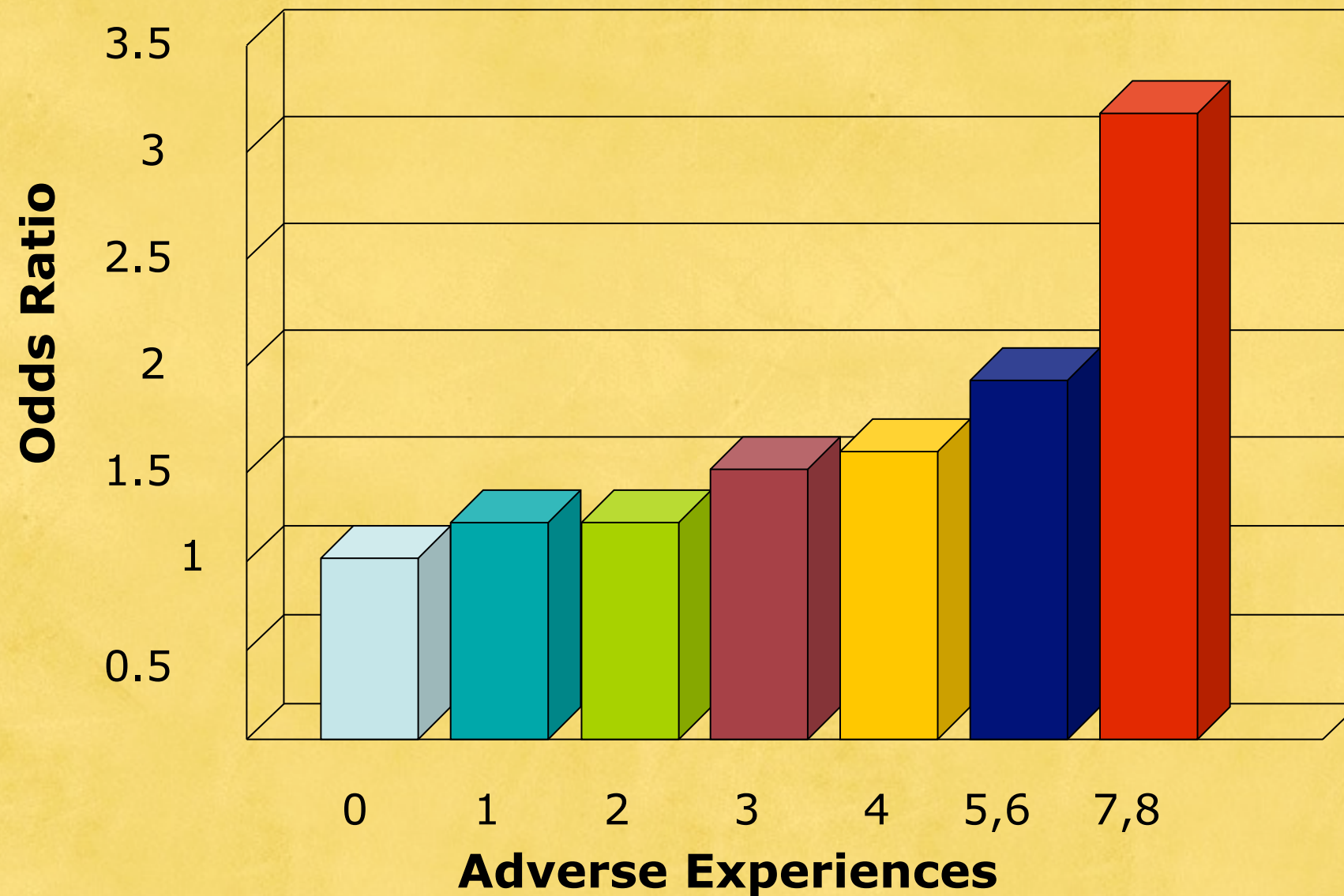
Not only are they unexpectedly common...  
...their effects are **cumulative**.

## Significant Adversity Impairs Development in the First Three Years



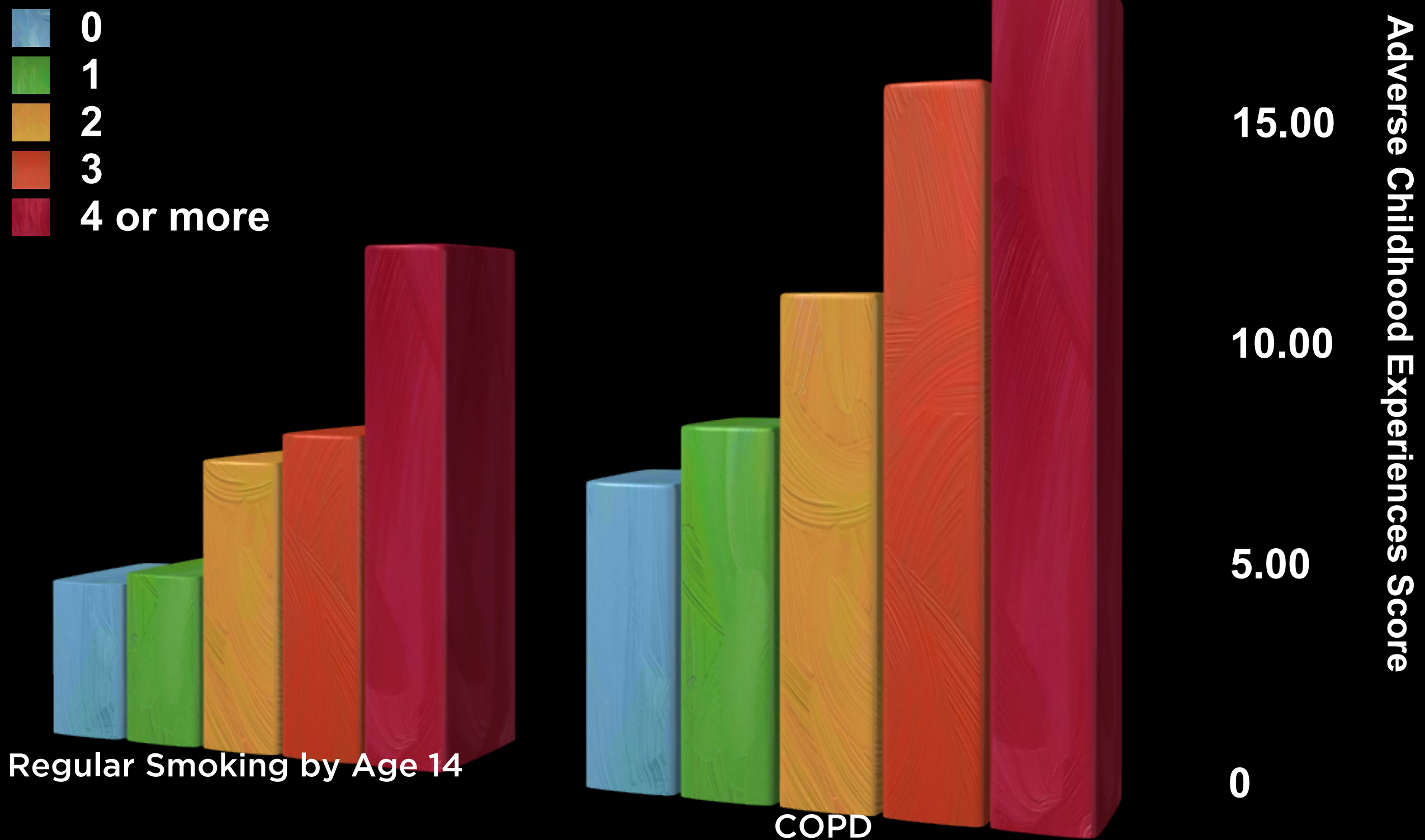
Source: Barth, et al. (2008) *via* Center on the Developing Child at Harvard University

# Risk Factors for Adult Heart Disease are Embedded in Adverse Childhood Experiences



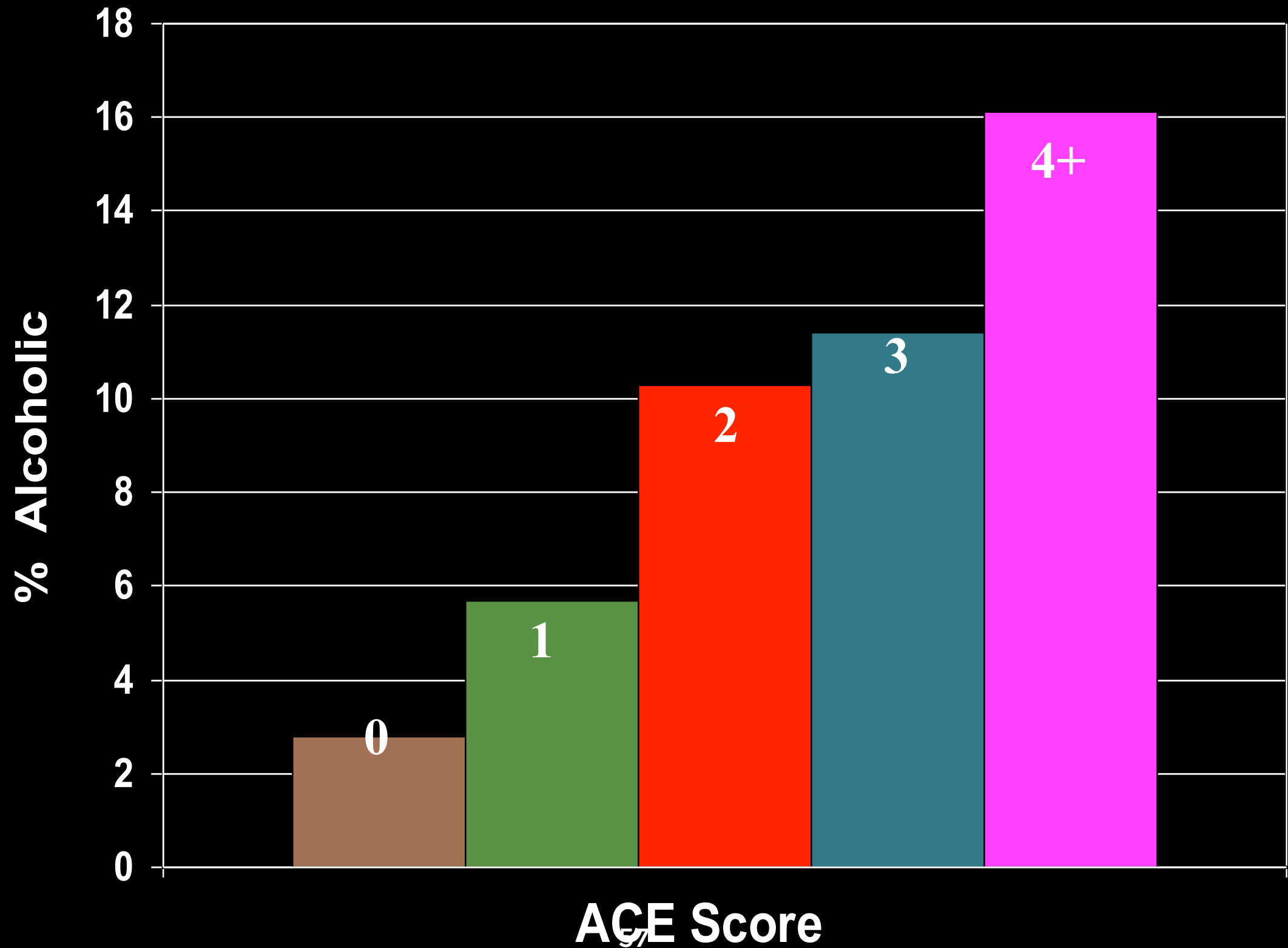
Source: Dong, et al. (2004) *via* Center on the Developing Child at Harvard University

# SMOKING & COPD

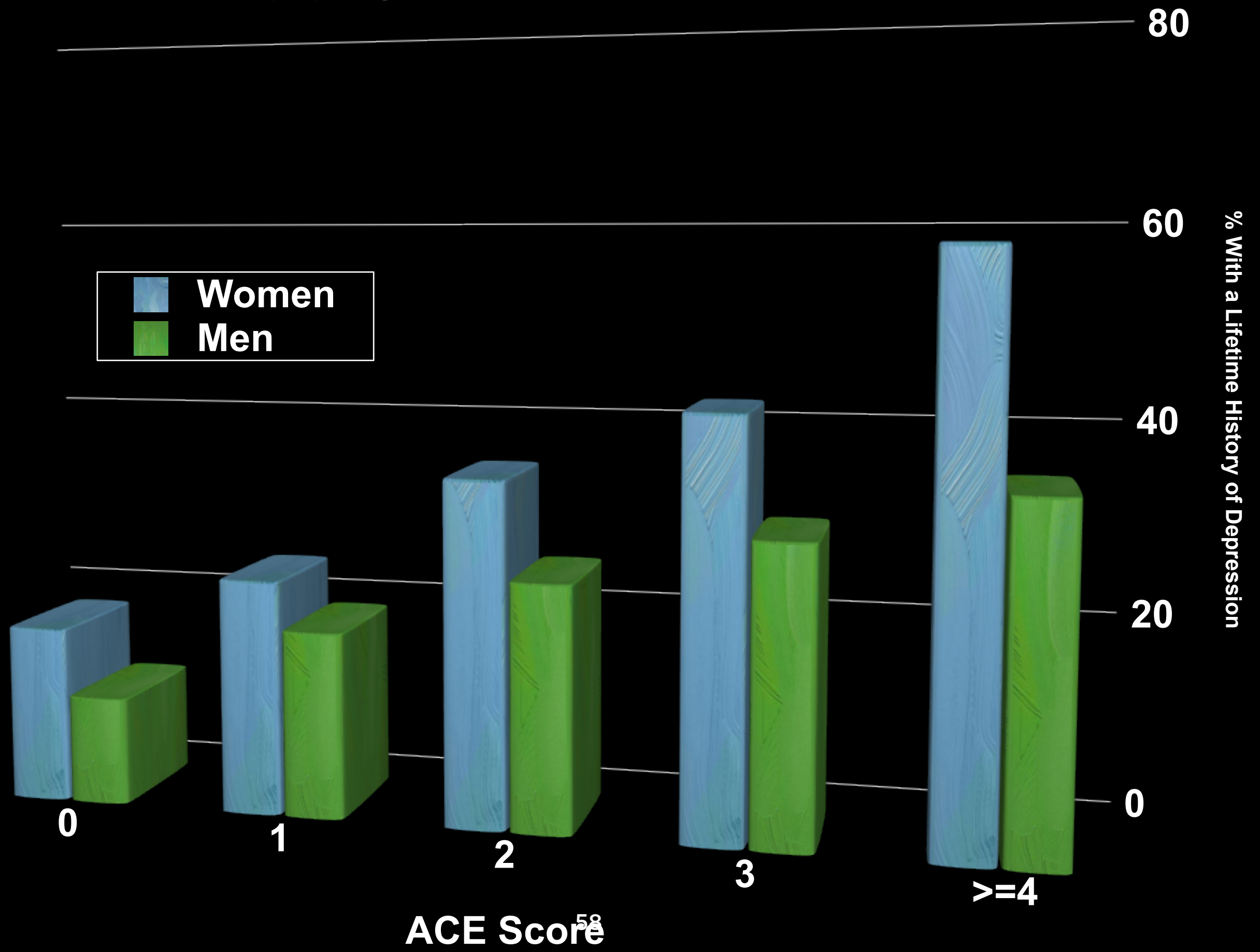




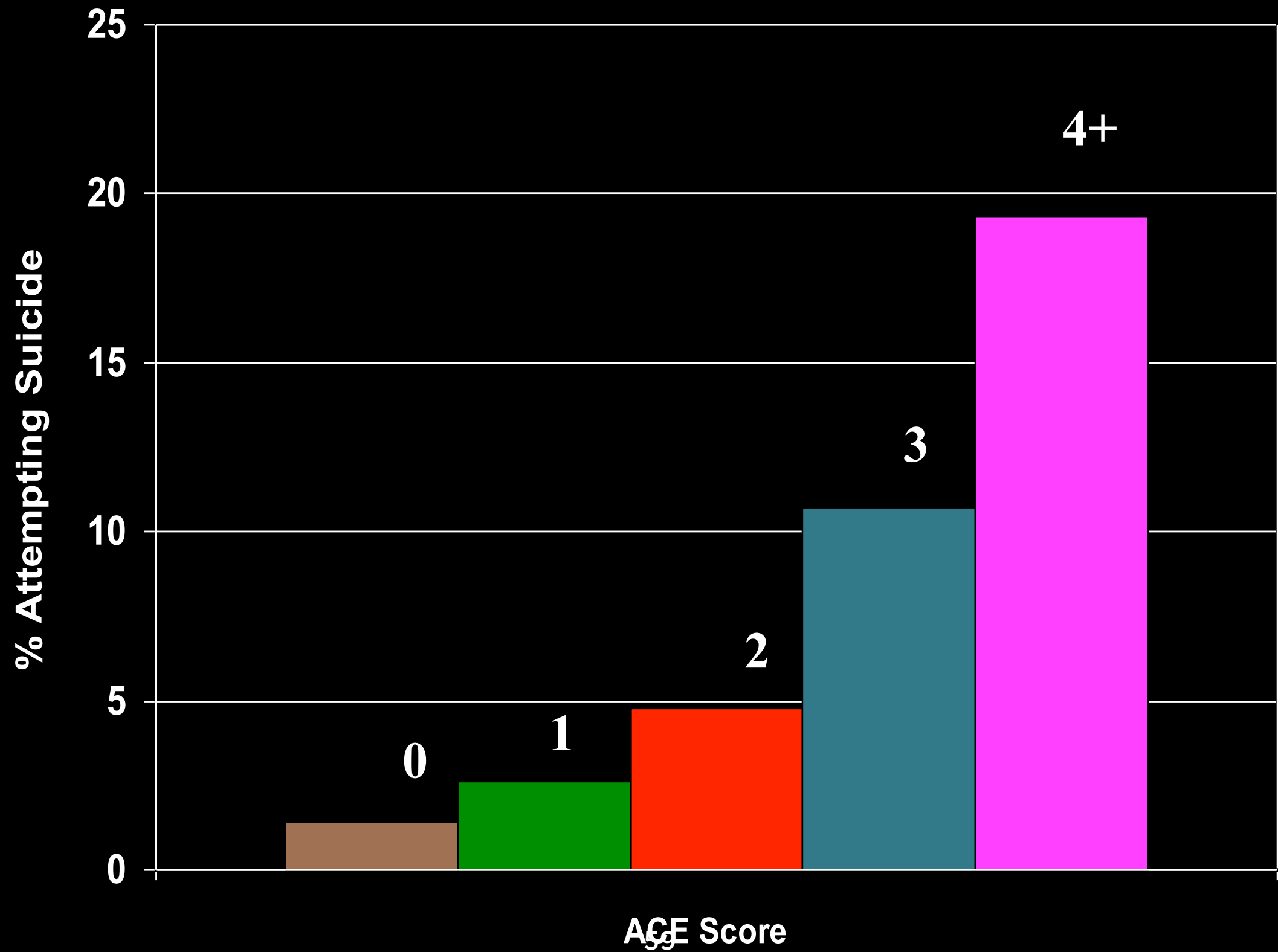
# Childhood Experiences vs. Adult Alcoholism



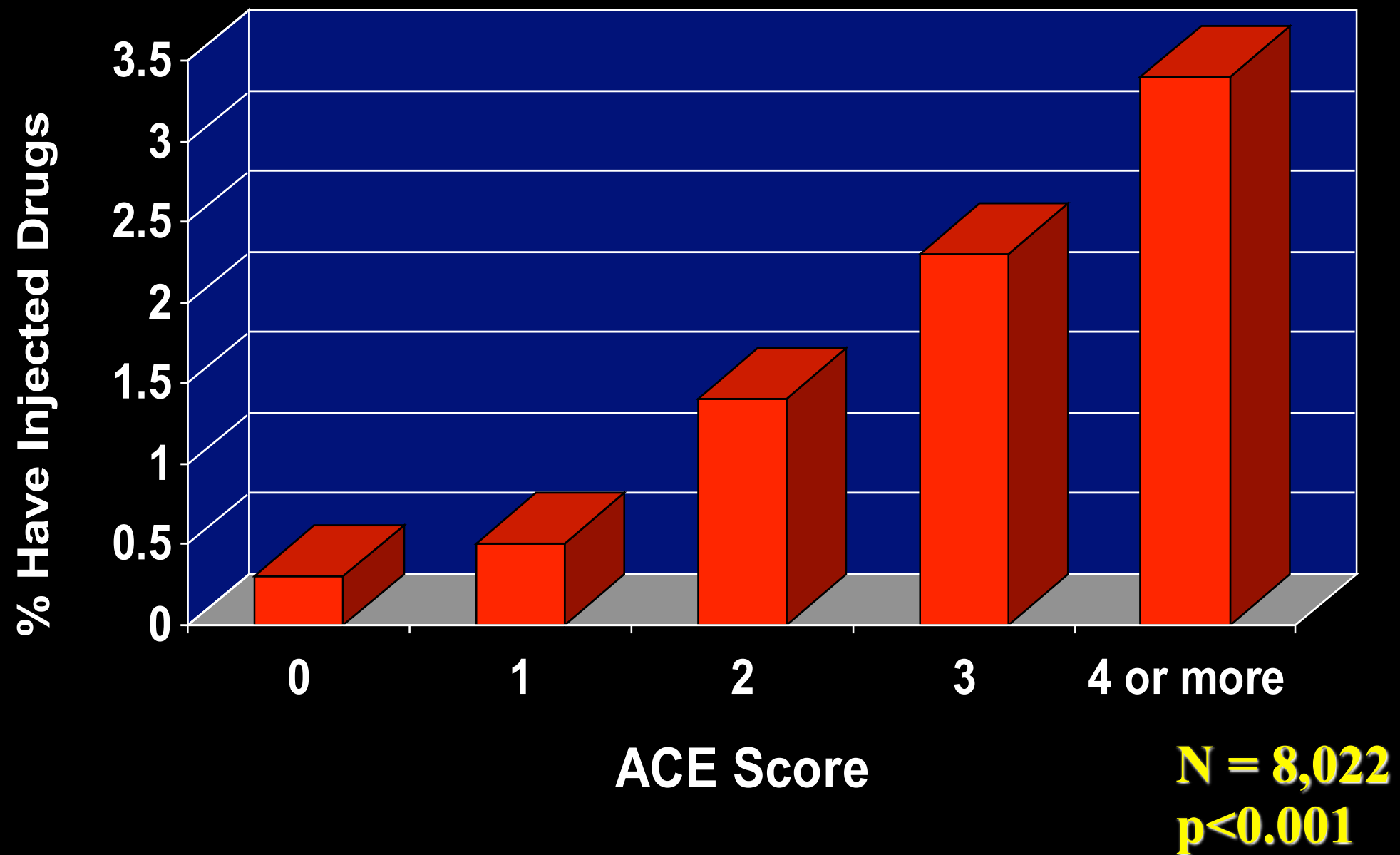
# DEPRESSION



# SUICIDE



# IV DRUG USE





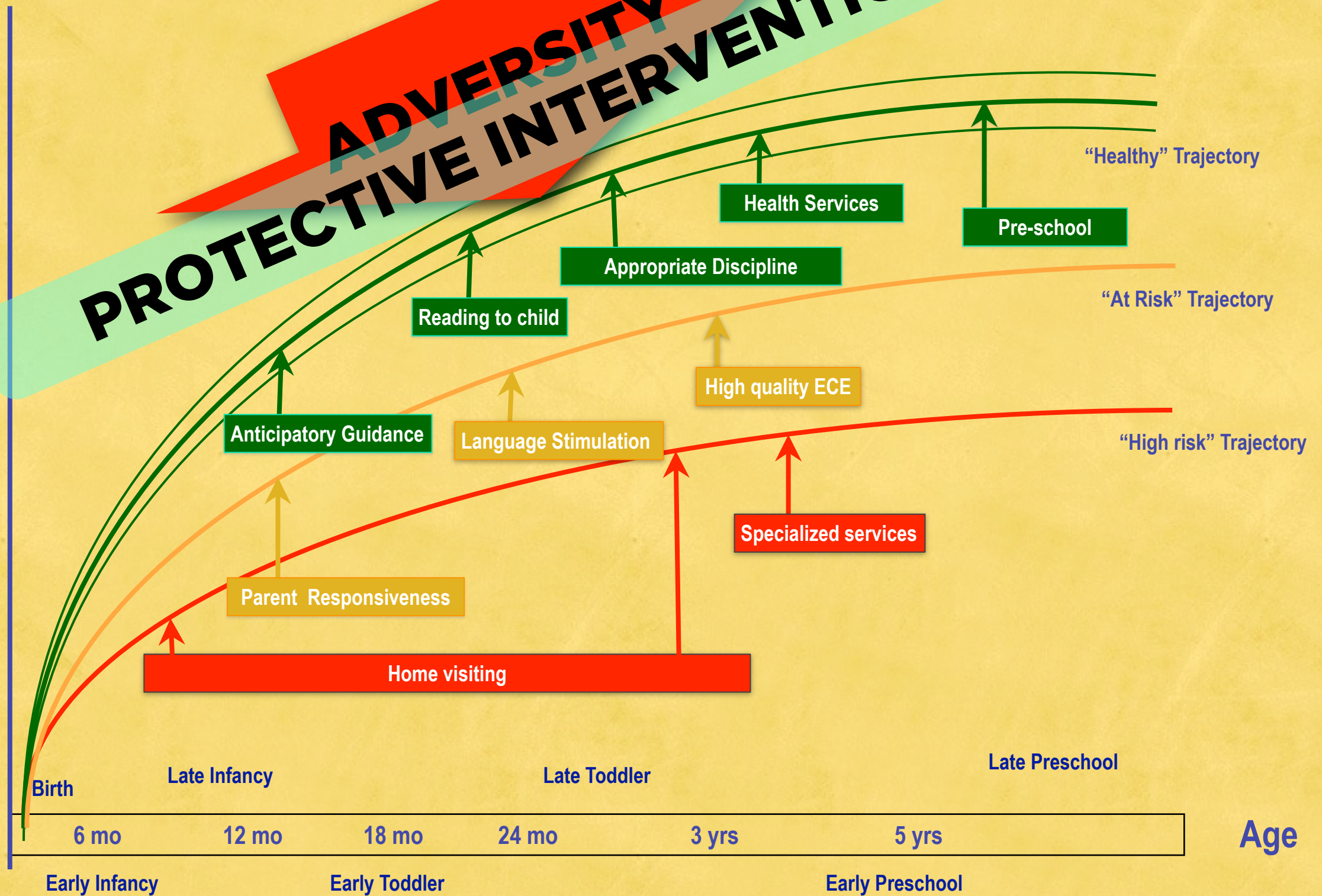
# EARLY BRAIN AND CHILD DEVELOPMENT

6

Creating the right conditions for early childhood development is likely to be **more effective and less costly** than addressing problems at a later age.

Developmental Progress

# ADVERSITY PROTECTIVE INTERVENTIONS



# **Three** Promising Domains for EB CD Innovation

Jack Shonkoff, MD

**Reduce emotional and behavioral barriers to learning.**

**Enhance the healthy development of children by transforming the lives of their parents.**

**Reconceptualize the health dimension of early childhood policy and practice.**

# **NONE** OF THIS IS TO SAY...

...that children should be engaged constantly

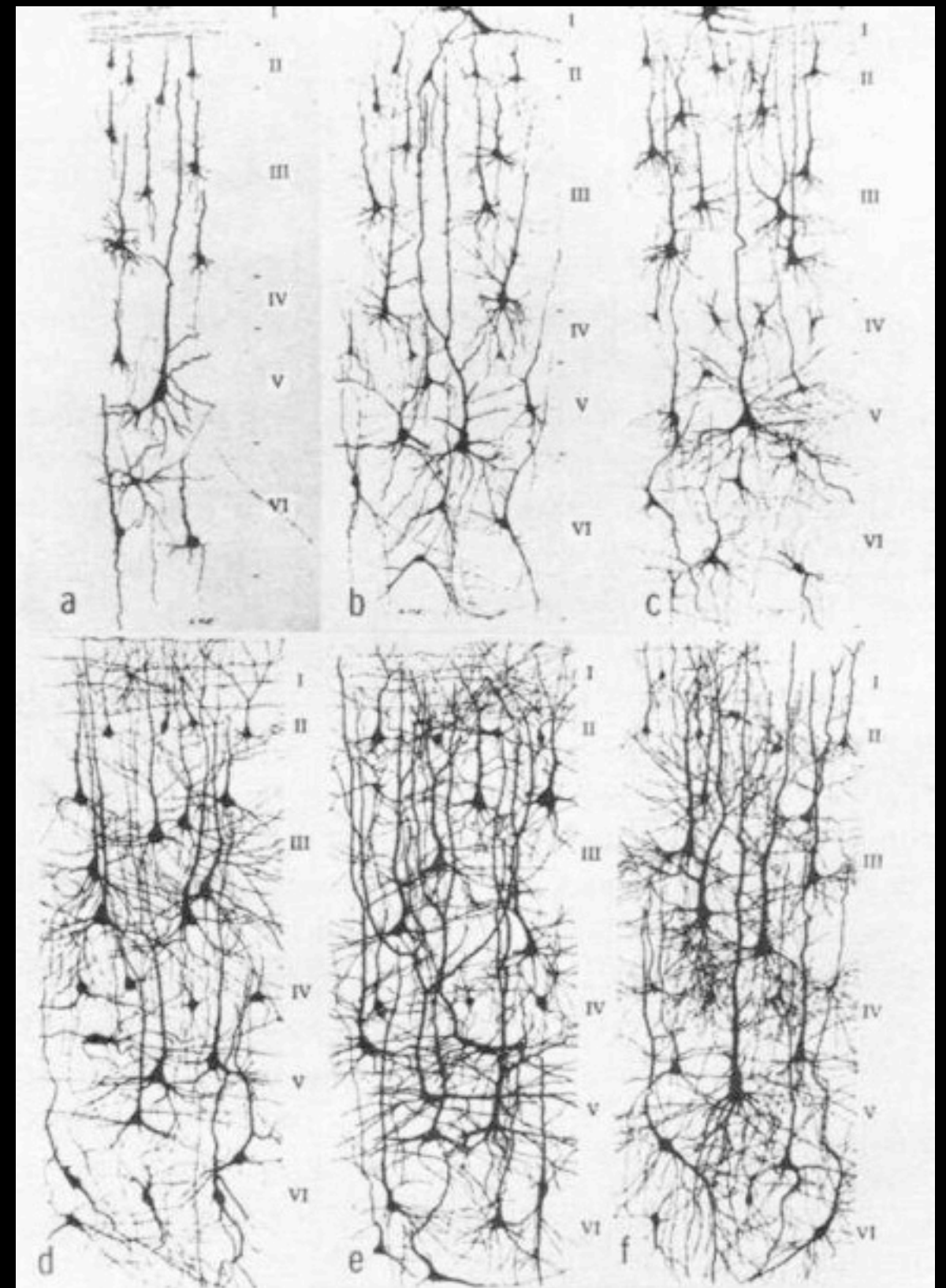
...that “bad things” are necessarily a long-term negative

...that children should not be appropriately disciplined



# **FIVE NUMBERS TO REMEMBER**

# 700 New Neural Connections per Second



Postnatal development of human cerebral cortex around Broca's Area (FCBm); camera lucida drawings from Golgi-Cox preparations. a: newborn; b: 1 month; c: 3 months; d: 6 months; e: 15 months; f: 24 months.

(from Conel, 1939-1959)

# 18 Months:

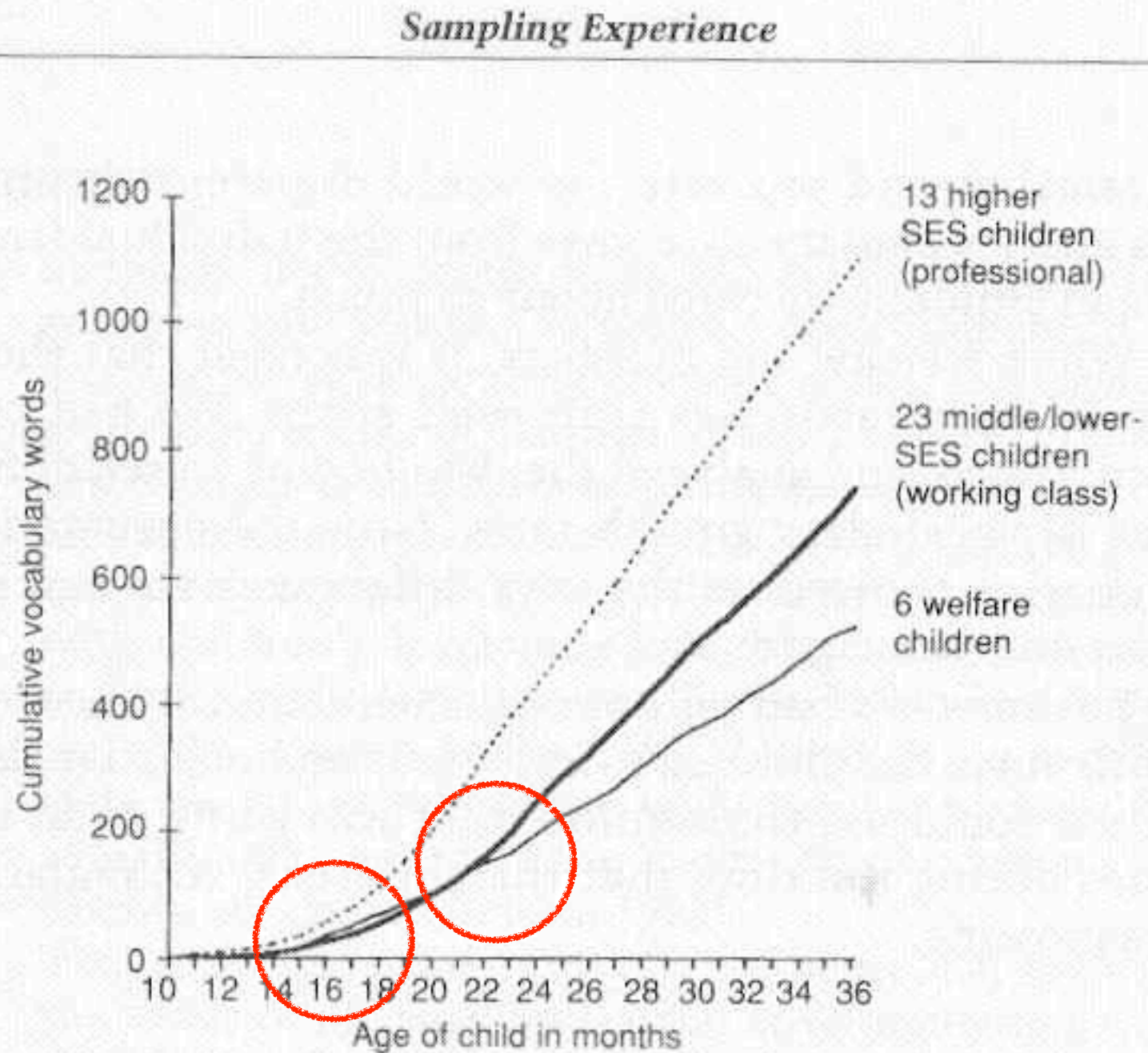


Figure 2. The widening gap we saw in the vocabulary growth of children from professional, working-class, and welfare families across their first 3 years of life. (See Appendix B for a detailed explanation of this figure.)



90-100%

Chance of  
Developmental Delays  
when Children Experience  
6-7 Risk Factors



**3:1 Odds**

**of Adult Heart Disease  
after 7-8 Adverse  
Childhood Experiences**



The background of the slide is a dense, overlapping pattern of US dollar bills. The bills are in various denominations, including \$100, \$50, and \$20. The image is darkened to a greyish tone to make the text stand out. The bills are oriented in different directions, creating a textured, financial backdrop.

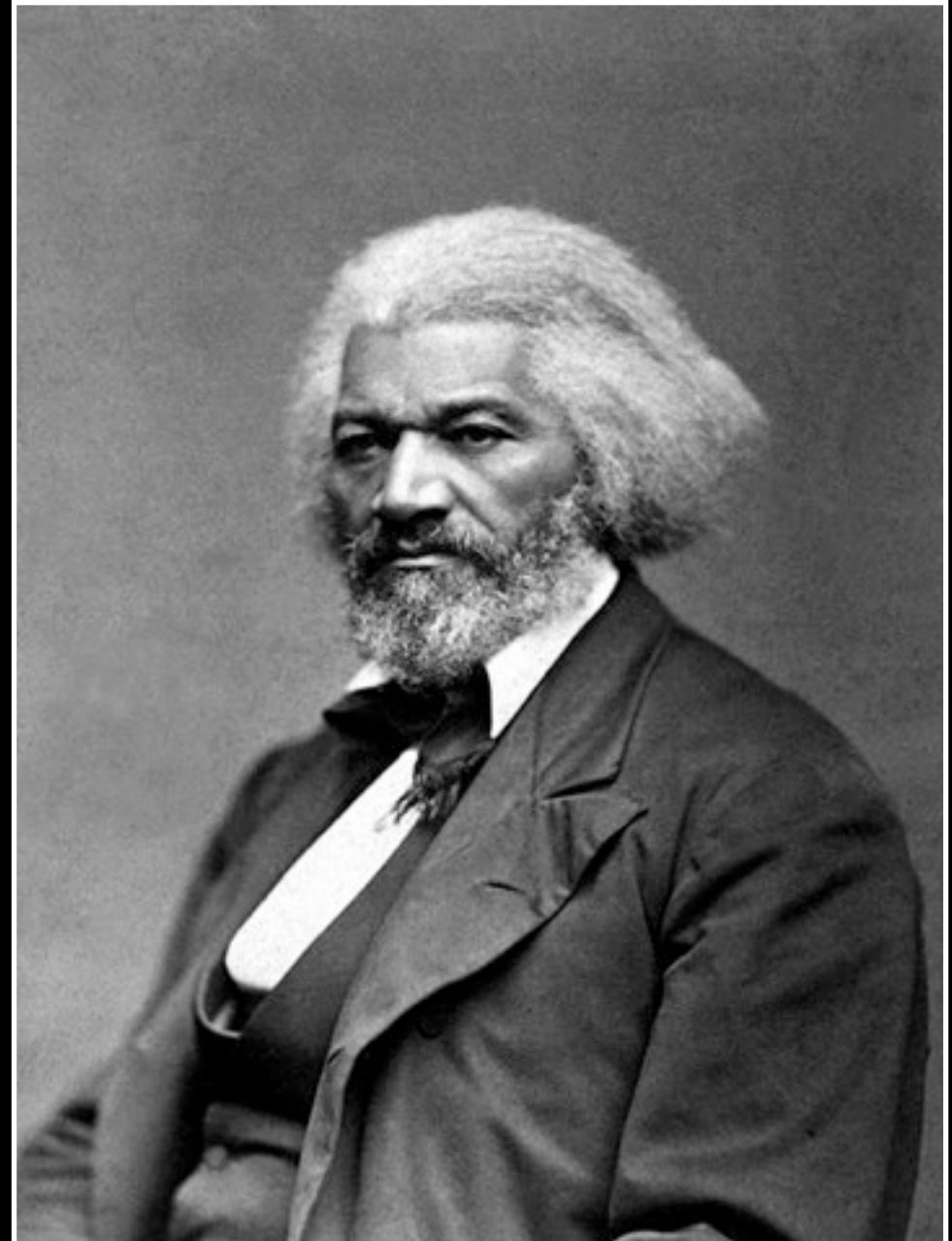
**\$4-\$9**

**in Returns for  
Every Dollar Invested  
in Early Childhood Programs**



**“It is easier to build  
strong children than to  
repair broken men.”**

**— Frederick Douglass  
(1817–1895)**



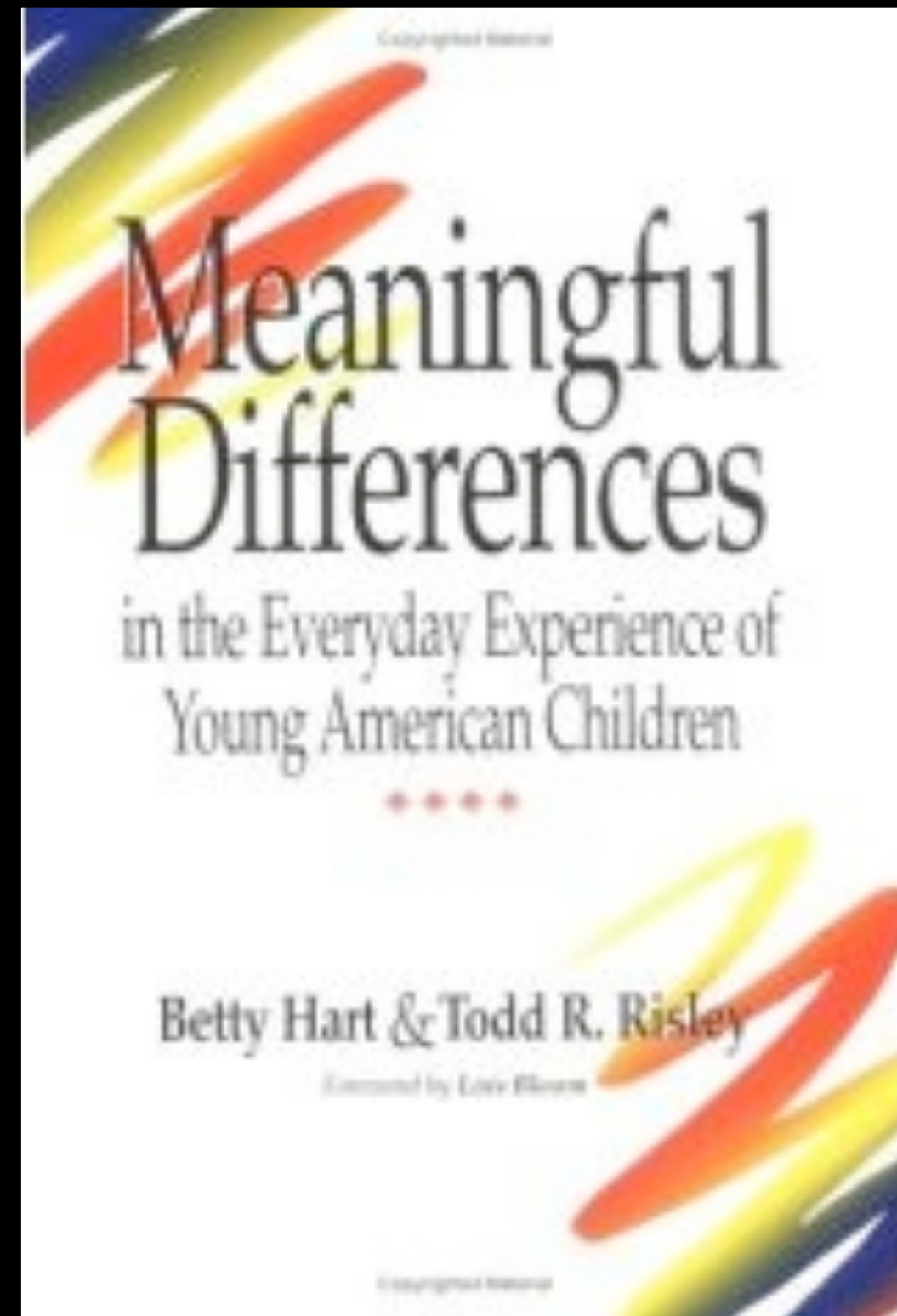


# *Part Two*

## Reading Reality

# Meaningful Differences in the Everyday Experiences of Young American Children.

Todd Risley &  
Betty Hart, 1995





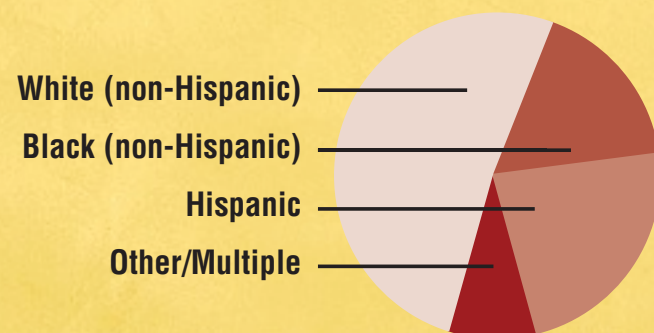
By Age 3...	Welfare	Professionals
Vocabulary Size	525 words	1100 words
IQ	79	117
Utterances	178/hour	487/hour
Encouragements	75,000	500,000
Discouragements	200,000	80,000

Children from low-income families hear as many as **20 million fewer** words than their more affluent peers before the age of 4.

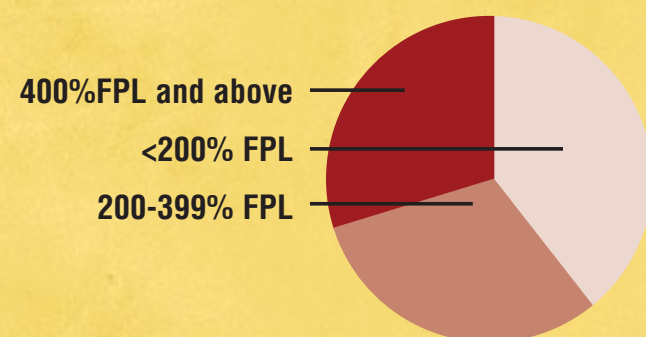


## NEW YORK

**Racial/Ethnic Distribution among Children Age 0-5 in New York (N~1.5 million)**



**Income Distribution among Children Age 0-5 in New York (N~1.5 million)**



NEW YORK	STATE	NATIONAL	STATE RANKING
<b>Parental Reading</b>			
% Children ages 0-5 read to daily <sup>1</sup>	48.4	47.8	28
<i>% Daily reading by poverty level <sup>1</sup></i>			
Less than 200% FPL	42.3	40.3	32
200-399% FPL	48.9	50.1	32
400% FPL or greater	58.9	58.9	25
<i>% Daily reading by race/ethnicity <sup>1</sup></i>			
White (non-Hispanic)	58.1	55.0	17
Non-White	37.8	37.8	32
Black (non-Hispanic)	37.8	38.1	
Hispanic	33.9	33.4	
Other/Multiple Race	/	46.4	
<i>% Daily reading by age <sup>1</sup></i>			
Children age 0-3 years read to daily	46.9	48.3	32
Children age 4-5 years	50.9	47.0	17
<b>Early Childhood Literacy Resources</b>			
% Children served by ROR <sup>2</sup>	19.5	12.8	8
% Children in/near poverty served by ROR <sup>2</sup>	41.0	26.0	9
Number of children age 0-5 per public library <sup>3</sup>	1,349	1,368	31*
<b>School Performance</b>			
% Students at or above Proficient in reading, Grade 4 <sup>4</sup>	34	30	17
% Children age 6-17 who have repeated at least one grade <sup>1</sup>	12.3	11.3	36*

# Low-income children are at a disadvantage before school begins

A TYPICAL MIDDLE-CLASS 5-YEAR-OLD IS ABLE TO IDENTIFY 22 LETTERS AND SOUNDS OF THE ALPHABET, COMPARED TO JUST 9 LETTERS FOR A CHILD FROM A LOW-INCOME FAMILY.

(WORDEN AND BOETTCHER, 1990; EHRI AND ROBERTS, 2006)

**A B C D E F G H I J K L M N O P Q R S T U V ~~W X Y Z~~**

MIDDLE-INCOME CHILD'S LETTER RECOGNITION (22 LETTERS)

**A B C D E F G H I ~~J K L M N O P Q R S T U V W X Y Z~~**

LOW-INCOME CHILD'S LETTER RECOGNITION (9 LETTERS)

MIDDLE-INCOME CHILD'S LETTER RECOGNITION (22 LETTERS)

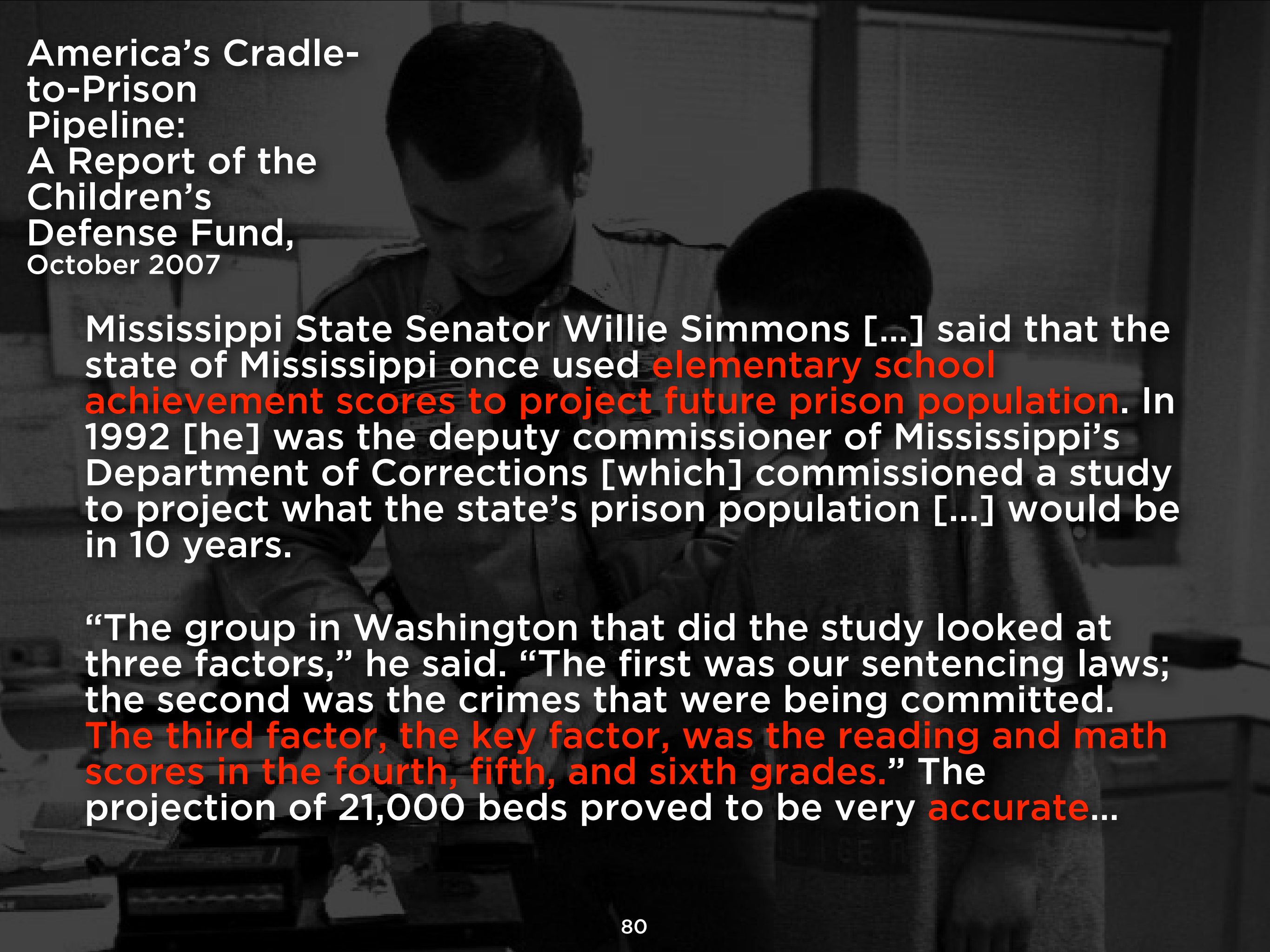
**A B C D E F G H I**

One-third  
of children  
enter school  
**unprepared**  
to learn.

Most <sup>(88%)</sup>  
will **never**  
catch up.





A grayscale photograph of a man and a young child looking down at a document together. The man is on the left, and the child is on the right. The background is slightly blurred, showing what appears to be an office or classroom setting.

# America's Cradle-to-Prison Pipeline: A Report of the Children's Defense Fund, October 2007

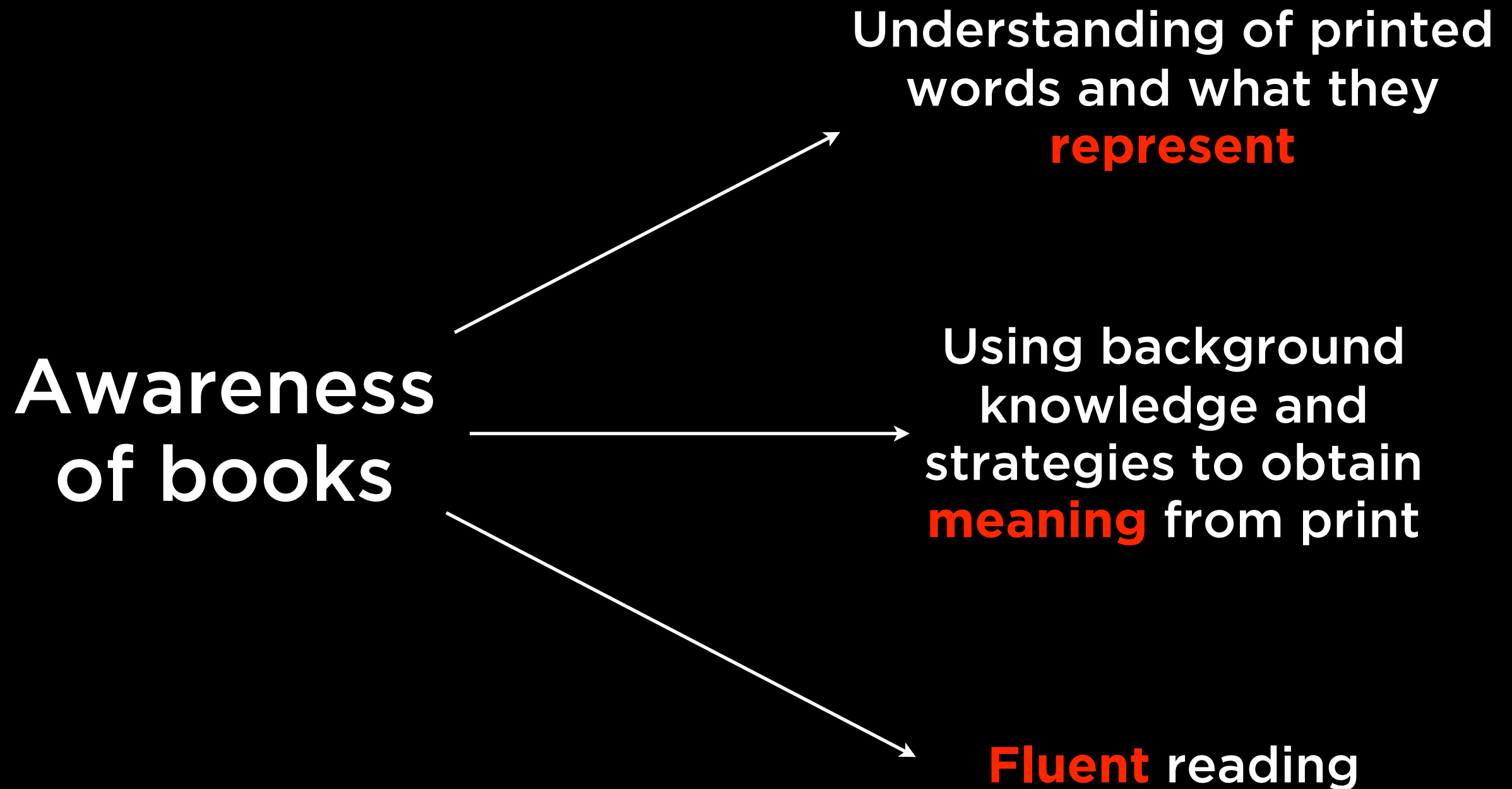
Mississippi State Senator Willie Simmons [...] said that the state of Mississippi once used **elementary school achievement scores to project future prison population**. In 1992 [he] was the deputy commissioner of Mississippi's Department of Corrections [which] commissioned a study to project what the state's prison population [...] would be in 10 years.

“The group in Washington that did the study looked at three factors,” he said. “The first was our sentencing laws; the second was the crimes that were being committed. **The third factor, the key factor, was the reading and math scores in the fourth, fifth, and sixth grades.**” The projection of 21,000 beds proved to be very **accurate...**



# Why Reading?

Reading is **the**  
fundamental skill  
for learning





Some people there are who, being grown, forget the horrible task of learning to read. It is perhaps the single greatest effort that the human undertakes, and he must do it as a child.

John Steinbeck

# Emergent Literacy:

the early display of an awareness by children that **print conveys information**. It is an amalgamation of children's oral language development and their initial attempts at reading and writing. Such attempts include "reading" the pictures of a book, or scribbling. Emergent literacy, **if supported** by meaningful interaction in oral and written language, **evolves into full literacy** skills. (Teale & Sulzby, 1986)

# Dialogic Reading:

The act of reading becomes a **conversation** between the adult and the child; the adult helps the child become the teller of the story by becoming the listener, questioner, and audience for the child.

**Reading to children**  
may not be a natural skill for adults.

**Reading at all** may not  
be something an adult is capable of.

**Reading problems** may have  
been an issue for generations.

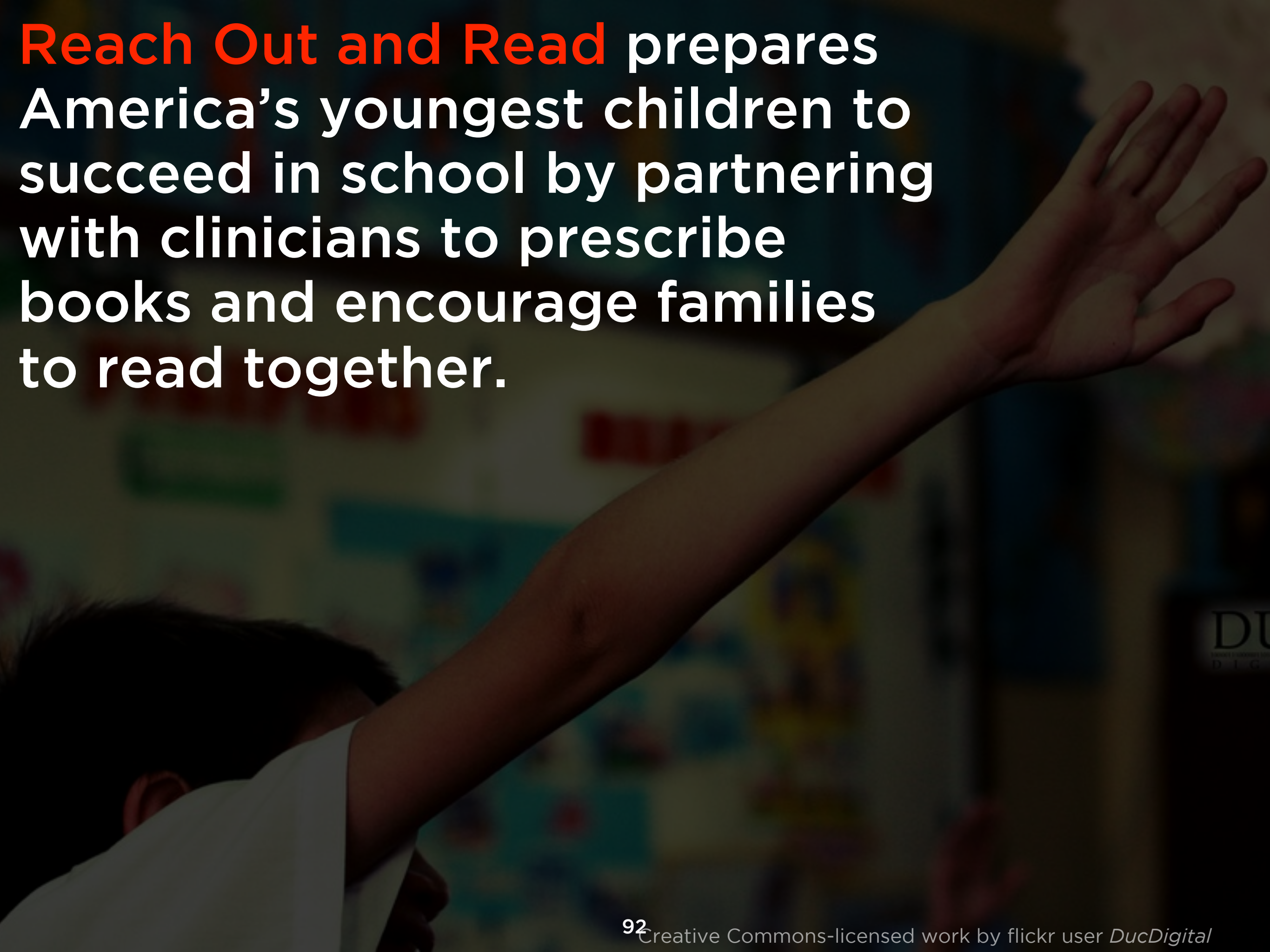


**Reading should be fun!**

# *Part Three*

**Reach Out and Read**



A child's arm is reaching upwards towards a display of colorful books. The background is slightly blurred, showing various book covers in shades of blue, green, and yellow. The text is overlaid on the left side of the image.

**Reach Out and Read** prepares  
America's youngest children to  
succeed in school by partnering  
with clinicians to prescribe  
books and encourage families  
to read together.



In the exam room, health care providers trained in the developmental strategies of early literacy encourage parents to **read aloud** to their young children, and offer age-appropriate tips.

## Prescription for Reading

Name: \_\_\_\_\_

Date: \_\_\_\_\_ Age: \_\_\_\_\_



**Rx**      *Read Books*

- ☐ Every night at bedtime
- ☐ For \_\_\_\_\_ minutes every day
- ☐ As needed

Refills: as requested at local public library

Signature: \_\_\_\_\_

Dipesh Navsaria, MPH, MSLIS, MD

Pediatrician & Occasional Children's Librarian

*Families:* Please visit [reading.pediatrics.wisc.edu](http://reading.pediatrics.wisc.edu) for more information on the joy of sharing books together and how it can make a huge difference in your child's life.

of sharing books together and how it can make a huge difference in your child's life.  
*Families:* Please visit [reading.pediatrics.wisc.edu](http://reading.pediatrics.wisc.edu) for more information on the joy

The primary care provider gives every child between the ages of 6 months and five years a new, developmentally-appropriate **children's book** to take home and keep.

"It is a great thing  
to start life with a  
small number of  
really good books  
which are your  
very own."



- Sir Arthur Conan Doyle, 1908

# Three

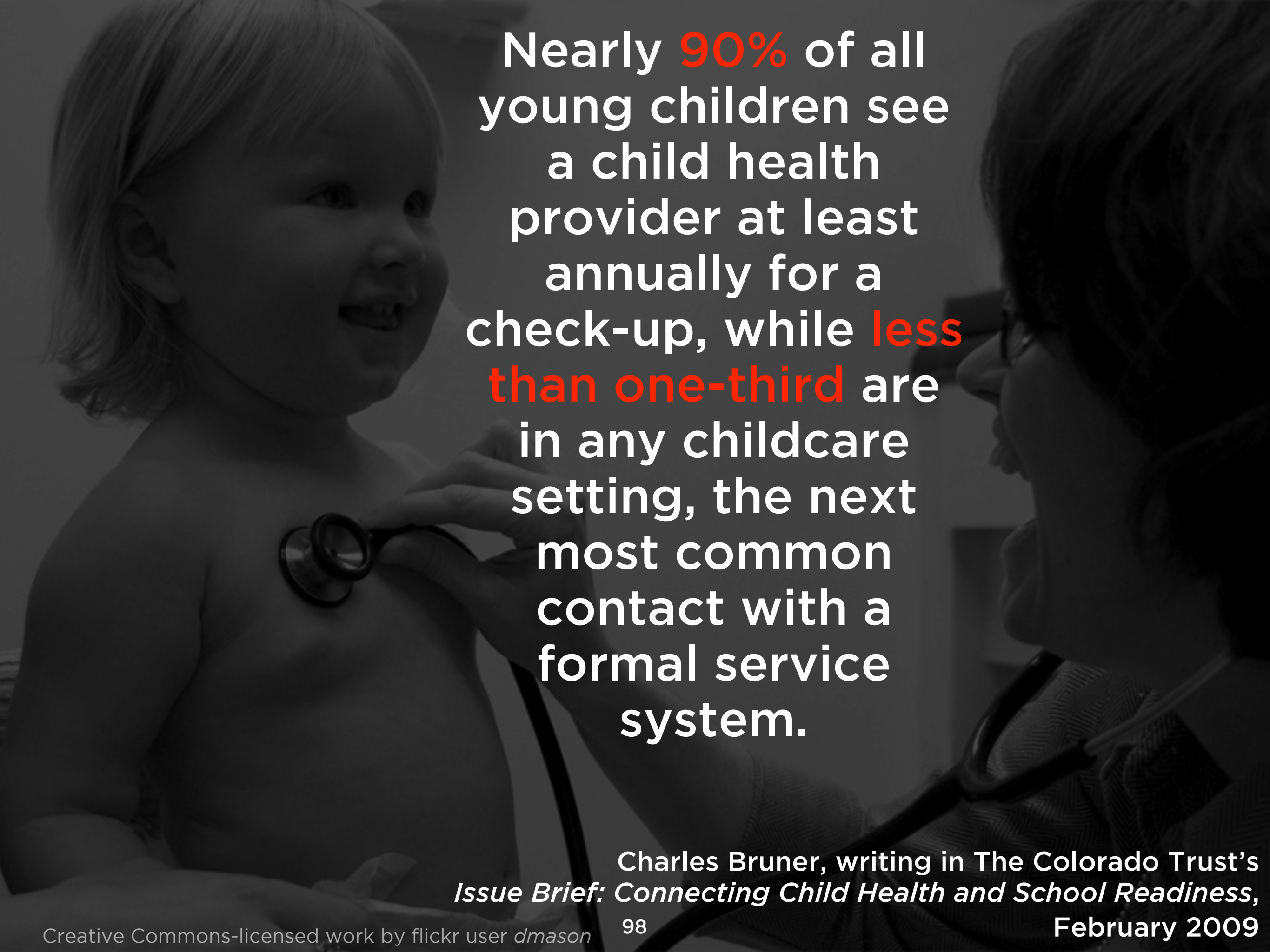
**Literacy-rich waiting rooms** feature books, posters and reading nooks. Volunteers read aloud to children, showing parents and children the techniques and pleasures of looking at books together.



# Our goal is **not** about

Teaching a child to actually read early

It is about learning to **love** books.



Nearly **90%** of all young children see a child health provider at least annually for a check-up, while **less than one-third** are in any childcare setting, the next most common contact with a formal service system.

Charles Bruner, writing in The Colorado Trust's  
*Issue Brief: Connecting Child Health and School Readiness*,

# Evidence

**15** studies published in  
peer-reviewed medical journals

ROR increases the likelihood that  
children at-risk will be read to regularly.

ROR improves language scores  
in young children at-risk.

ROR improves the home literacy environment.

There is **more** extensive published research  
available supporting the ROR model than for **any**  
**other** psychosocial intervention in general  
pediatrics.

The British *Millennium Cohort Study*  
*Pediatrics*, February 2010

12,500 children given vocabulary tests at age 5  
Delays of almost a **year** in the poorest homes

“The research shows that a child who is read to every day at age 3 has a vocabulary at age 5 that is **1.92 months more advanced** than a child who has exactly the same observable characteristics (including income group), but who is not read to every day at age 3.”



“More affluent family circumstances are clearly associated with better parenting behaviours. At age 3, 78% of the richest children were **read to daily** and 91% had regular bedtimes, much higher than the corresponding numbers for the lowest income group.”

“Nevertheless, it is still the case that 45% and 70% of the lowest income parents practiced these beneficial behaviours, providing grounds for optimism that **good parenting can be adopted and extended in even the most disadvantaged families.**”

Parenting Behaviours, Perceptions, and Psychosocial Risk:  
Impacts on Young Children's Development  
Glascoe FP, Leew S. *Pediatrics*, January 2010  
382 families assessed for child language development

“Of the families who seemed to be nonreaders or limited book readers, 21% had children at risk for developmental problems, compared with 12% of the families who were book readers...Families for whom book reading was uncommon were almost **twice as likely to have a child with delays.**”

“By 6 months of age, children whose parents **read aloud frequently outperformed children whose parents read rarely**; this pattern continued through 24 months of age.”

“Differences in communications skills increased with age, and the magnitude of the discrepancy between groups increased steadily with the age of the child.”

“Another critical focus for future studies is to operationalize parenting behaviors/perceptions into developmental promotion interventions that are **brief and workable in busy primary care settings**, following the example of effectiveness research established by the Reach Out and Read program.”

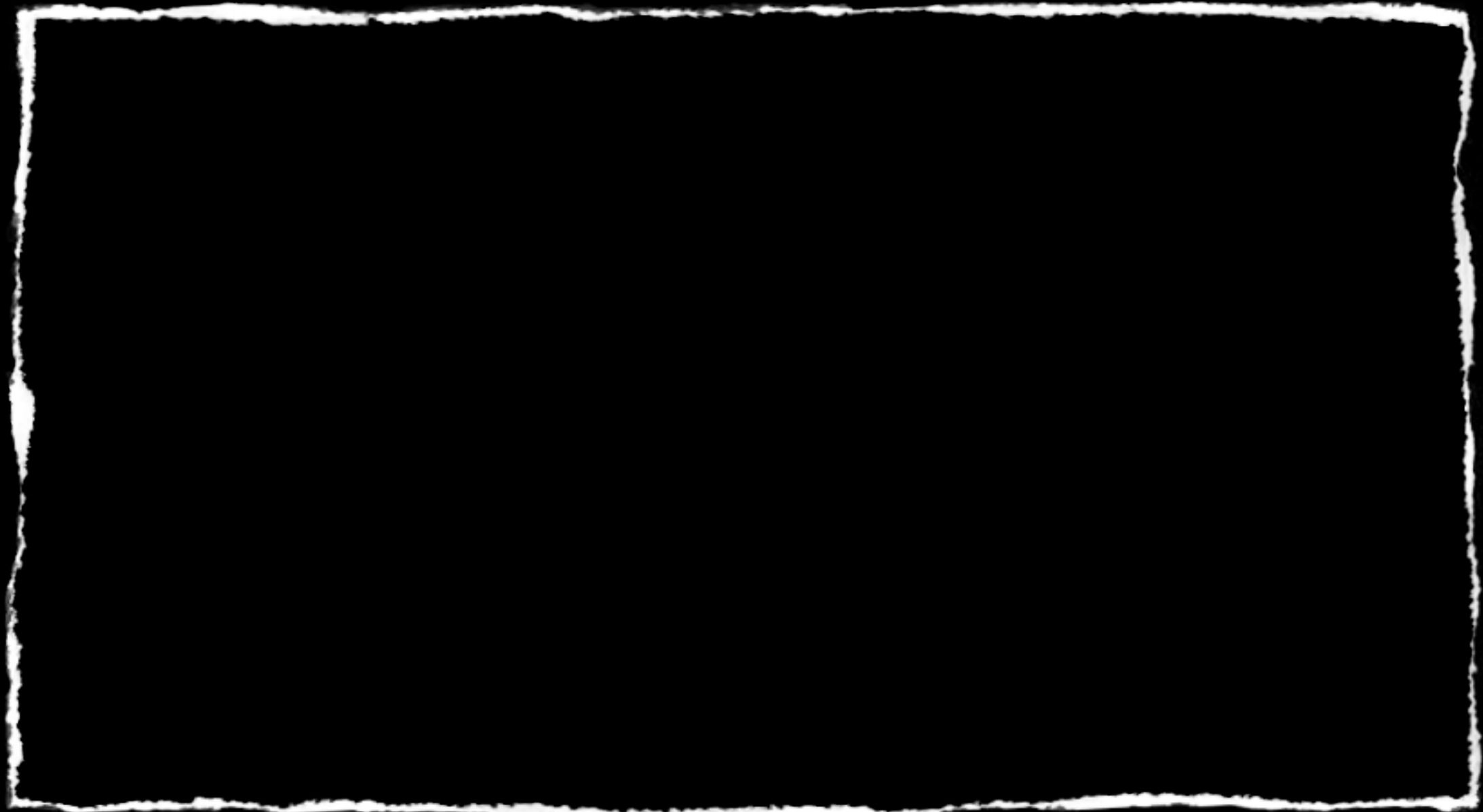
# What we do

Reach Out and Read in the Exam Room

Videos courtesy of Reach Out and Read – Massachusetts



*Nyla*



**12-15 months**

What did we  
learn?

Constant, happy babble:  
exposed to language &  
books

Calms and tunes to  
Dad when she  
reads

*Child*

Eagerly  
explores book  
with eyes/  
hands/mouth

Holds book and turns  
pages easily

Allows Nyla  
control of  
book

Describes enjoyment of  
quality time; notice joint  
attention

*Parent*

Encouraged  
not to give  
up

Points to objects  
to engage and  
teach



nearly **5,000** sites nationally...

in all **50** states...

serving over **4 million** children...

via more than **28 thousand**  
health care providers...

giving out over **6.5 million** books a year!

# ADVICE FOR PARENTS

**Read** aloud together daily.

Have a bedside lamp for your child and allow reading time every night possible.

**Limit screen time** to less than two hours a day.

**No** TV, computers or video games in bedrooms.

Audio Books are fine.

Visit your school and public **libraries**.

Have reading be **fun**, not a chore.



# Change the First Five Years and You Change Everything



## Ounce of Prevention Fund

“While schools can do much to raise achievement among children who initially lag behind their peers, all too often pre-school gaps set in train a pattern of **ever increasing inequality** during school years and beyond.

Any drive to improve social mobility must begin with an effective strategy to **nurture the fledgling talent in young children** so often lost before it has had a chance to flourish.”

The Sutton Trust

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THE  
END

